

REPORT
of
The North Carolina
Department of Agriculture
For the Biennium 1934-1936

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LETTER OF TRANSMITTAL

*To His Excellency, J. C. B. EHRLINGHAUS,
Governor of North Carolina:*

SIR:

In compliance with Chapter 248, Public Laws of 1929, I submit the following report of the work of the Department of Agriculture for the biennium 1934-1936.

Respectfully,

A handwritten signature in dark ink, appearing to read "W. A. Graham". The signature is fluid and cursive, with the first name "W." and last name "Graham" clearly distinguishable.

Commissioner of Agriculture.

RALEIGH, N. C.,
NOVEMBER 1, 1936.

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PERSONNEL

OF THE

STATE DEPARTMENT OF AGRICULTURE

STATE BOARD OF AGRICULTURE

WM. A. GRAHAM, *Commissioner, Chairman*, Raleigh

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C. S. YOUNG	Shelby
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W. H. RICHARDSON	<i>Editor of Publications</i>
M. H. HILL	<i>Principal Accounting Clerk</i>
C. P. DEYTON	<i>Junior Accounting Clerk</i>

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SAVINGS AND LOAN

H. M. BERRY	<i>Agricultural Credit Specialist</i>
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W. G. HAYWOOD	<i>Senior Chemist</i>
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Z. B. BRADFORD	<i>Associate Chemist</i>
E. T. HORD	<i>Junior Chemist</i>
W. B. HENDRIX	<i>Junior Chemist</i>
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J. S. PITTARD	<i>Junior Chemist</i>
W. P. MATTHEWS	<i>Junior Chemist</i>
MARY S. BIRDSONG	<i>Secretary</i>
MRS. HEBER B. HATCH	<i>Senior Stenographer Clerk</i>

ENTOMOLOGY

R. W. LEIBY	<i>Senior Entomologist</i>
J. A. HARRIS	<i>Associate Entomologist</i>
C. S. BRIMLEY	<i>Junior Entomologist</i>
D. L. WRAY, JR.	<i>Junior Entomologist</i>
MRS. PAULINE NEWSOME	<i>Senior Stenographer Clerk</i>
J. T. PAGE	<i>Inspector</i>

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SUSIE D. ALLEN	<i>Supervising Seed Analyst</i>
MILDRED HENRY	<i>Seed Analyst</i>
ELIZABETH EBY	<i>Seed Analyst</i>
RUTH UPCHURCH	<i>Seed Analyst</i>
KATE BALLARD	<i>Senior Stenographer Clerk</i>

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W. A. QUEEN	<i>Associate Chemist</i>
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E. W. CONSTABLE	<i>Associate Chemist</i>
J. J. PARKER, JR.	<i>Chemist</i>
SARAH G. ALLEN	<i>Principal General Clerk</i>
PEARL KOONTZ	<i>Senior Stenographer Clerk</i>

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FRANK PARKER	<i>Statistician (Federal)</i>
WM. H. RHODES	<i>Associate Statistician</i>
W. R. RAND	<i>Junior Statistician</i>
MRS. E. R. SIMPSON	<i>Senior Statistical Clerk</i>
MRS. REBECCA ETHERIDGE	<i>Senior Statistical Clerk</i>
MRS. CATHERINE W. HAIG	<i>Senior Statistical Clerk</i>
MRS. POLK DENMARK	<i>Senior Statistical Clerk</i>
MRS. SARAH DRAKE	<i>Junior Statistical Clerk</i>
HERBERT BARNES	<i>Senior Mailing Clerk</i>

MUSEUM

H. H. BRIMLEY	<i>Curator</i>
H. T. DAVIS	<i>Associate Curator</i>

VETERINARY

WM. MOORE	<i>Senior Veterinarian</i>
L. J. FAULHABER	<i>Associate Veterinarian</i>
B. H. STATON	<i>Junior Veterinarian</i>
H. S. WILFONG	<i>Junior Bacteriologist</i>
MRS. L. S. HARRIS	<i>Senior Stenographer</i>

BIENNIAL REPORT

WAREHOUSE

A. B. FAIRLEY	Superintendent
C. R. REYNOLDS	Senior Cotton Classer
J. B. HAYWOOD	Junior Cotton Classer
MRS. NELLA MASON	Senior Stenographer
ELIZABETH BRANTLEY	Senior Stenographer

TEST FARM STAFF

F. E. MILLER	Director and Horticulturist
LOUISE B. WRIGHT	Stenographer, Clerk
R. E. CURRIN, JR., Assistant Director in Charge, Upper Coastal Plain Station, Rocky Mount.	
W. C. ALLSBROOK	Herdsmen
J. P. YOUNG, Assistant Tobacco Investigations, U. S. Department of Agri- culture.	
J. W. HENDRICKS, Assistant Director in Charge, Piedmont Station, Statesville	
HASELTINE NICHOLSON	Stenographer, Clerk
GRADY BERRY	Foreman
R. E. STITT	Assistant Agronomist, U. S. Department of Agriculture
S. C. CLAPP	Assistant Director in Charge, Mountain Station, Swannanoa
H. B. COULTER	Dairyman
W. H. WHISENHUNT	Foreman
HERBERT SMITH	Poultryman
CHAS. T. DEARING, Assistant Director in Charge, Coastal Plain Station, Willard.	
D. P. SOUTHERLAND	Foreman
R. T. CALDWELL	Dairyman
C. O. BOLLINGER	Poultryman
BENNIE LOU WILLIAMS	Stenographer, Clerk
G. A. MECKSTROTH	Associate Pathologist, U. S. Department of Agriculture
E. G. MOSS	Assistant Director in Charge, Tobacco Station, Oxford
ELIZABETH FLOYD	Stenographer, Clerk
JAMES F. BULLOCK	Agent, U. S. Department of Agriculture
H. J. SHAW	Agent, U. S. Department of Agriculture
J. E. SMITH	Agent, U. S. Department of Agriculture
A. B. DEAN	Foreman
J. L. REA, JR.	Assistant Director in Charge, Blackland Station, Wenona
A. P. LEFEVERS	Foreman
E. BRYAN HARRIS	Herdsmen

DAIRY

A. H. KERR	Dairy Specialist
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WEIGHTS AND MEASURES

C. D. BAUCOM	Superintendent
O. L. YATES	Inspector
L. P. EAGLES	Inspector

BIENNIAL REPORT OF THE NORTH CAROLINA DEPARTMENT OF AGRICULTURE

By WILLIAM A. GRAHAM, Commissioner of Agriculture

When I assumed the duties of Commissioner of Agriculture a dozen years ago, having been appointed by Governor Cameron Morrison to succeed my honored father, who had been called to his eternal reward, it was with a determination to fulfill my obligation to my State and to the farmers of North Carolina to the best of my ability.

This Biennial Report, required by law, is for the purpose of setting forth the various activities of the Department of Agriculture for the past two years. It would be impossible, therefore, for me to review, in full, the accomplishments of the past 13 years. These have become a part of the permanent records of this State, as set forth from biennium to biennium, and, in closing my administration, I do so without apology to any man or group of men, supported by the internal satisfaction that I have performed my duties, in all fairness, and without partiality, in the sight of God and man.

The past two-year period has witnessed many changes in the social and economic order. Numerous experiments have been set in motion, some of which will prove beneficial and permanent, while others, quite naturally, will be found inadequate.

Whatever may be said of the methods being employed; whatever conjectures may be advanced as to where these methods will lead, in the ultimate, it is very apparent that agriculture can no longer be relegated to a place of obscurity in our national life.

Agriculture must be given an opportunity on equality with that accorded industry. There could be no manufactured product without, first, the raw material—and the raw material is the direct product of agriculture; hence, industry is one hundred per cent dependent upon agriculture for its continued existence, and it must, therefore, take the farmer's well-being into account.

Men of all political schools of thought are discussing ways and means of bringing further relief and assistance to millions of

Americans who are directly dependent upon the soil but who, in the past, have had to be content with the crumbs that fell from the political table. There must, hereafter, be a permanent seat for them at the table.

There can be no doubt but that we have come a long way out of the depression, which became so acute in the fall of 1929 and brought deepening gloom as subsequent years passed. This nation never will again enjoy the same brand of "prosperity" that appeared to be prevalent on all sides prior to 1929, but that brand of prosperity was based on excessive spending and the idea of conservation had little place in the general scheme of things.

Real prosperity is not confined simply to the abundance of things but must take into account the uses to which they are put. Unutilized natural resources might easily become a burden. As an example of this, taxes might easily consume an unworked gold mine, while ten acres of truck, judiciously handled, might earn a living for an entire family and educate the children of the group. Progress, therefore, is a relative term, depending largely upon standards of attainment, chiefly the goal in view. In many ways, North Carolina, including all its human activities, has made substantial progress during the past quarter of a century; in others, it has not. However, to dissect the factors that contribute to prosperity, or progress, is the work of the economist. The lay mind might easily become confused traveling through the labyrinth of facts and figures to be threaded during this tedious journey.

Since America was first settled, its stock has been sturdy and its people have been used to meeting and coping with difficult situations. Our nation was born under adverse conditions and brought forth to battle against odds. North Carolina, one of the oldest of the Commonwealths that make up the Union, is a land that is favored by Providence but, in the course of our development, through the years dating back to the first settlements in 1663, we have been meeting and overcoming difficulties. Following the War Between the States, North Carolina, like other sections of the depleted South, lay prostrate on the roadside of economic disaster. Conditions existing here were no worse than in surrounding States—and no better. Our reconstruction difficulties were synonymous with those prevailing in neighboring sections.

North Carolina shared in the gradual awakening that marked the period immediately preceding the World War; and, when that great conflict was over, it was thrown into the economic, educational and agricultural boom that marked the era that

ended in 1929. We had our share in the depression, but, withal, were in a much better shape in a great many ways than were some of the other sections of our great Republic. During the post-war days we had spent freely, but, it developed, we had spent wisely, in the construction of schools and roads and in the establishment of firm foundations in general.

Prosperity in North Carolina, in former years, was dependent upon cotton. This is not true any longer, as the records will show. In 1935 cotton was neither first nor second in value, except in that the \$8,372,000 accredited to cottonseed, taken with the \$33,199,000 for lint, made a figure greater than \$37,335,000, which was the value of the corn crop, while tobacco brought \$117,461,000. The cotton crop one year—1923—brought \$157,-080,000. The average price per pound that year was 30.8 cents. In 1919, when the price was 35 cents, North Carolina's 830,293 bales, produced on 1,490,000 acres, brought \$146,232,000.

During my term of office, I have seen North Carolina's cotton acreage voluntarily reduced nearly 50 per cent, without the passage of coercive legislation. I always opposed this; I always will; it is undemocratic. I acquiesced in the Federal cotton control act because it was enacted to meet an emergency such as does not constitute the general rule. There are many matters connected with grave crises which would not be advisable in normal times. I am glad that North Carolina's cotton acreage reduction program has been voluntary, for it bespeaks a patriotic spirit on the part of our farmers, in whom I have always had the greatest degree of confidence.

North Carolina started back to prosperity in 1933, as reflected in crop values. The total value that year was 66.5 per cent over the 1932 total; in 1934 it was 115 per cent over the 1932 total, and in 1935, it was 106.5 per cent above the 1932 total.

The total value, in money, of North Carolina's 1935 crops was \$246,348,000, as compared with \$755,679,000 for the entire South Atlantic group, including Delaware, Maryland, Virginia, West Virginia, South Carolina, Georgia and Florida. The nearest approach in any one of these States was \$157,353,000 reported by Georgia.

North Carolina's rank in crop values in 1935 was fifth, as compared with third in 1934. This, however, was due to drought conditions in Iowa and Illinois. In value per acre in 1935, we ranked seventh, at \$40.04. Texas, which continued to hold first place in total values, ranked thirty-seventh in its per acre value, at only \$13.62, while other great agricultural States showed values far below North Carolina's per acre showing.

This indicates that our farmers are going beyond the one and two-crop idea and are practicing diversified and intensive farming to a greater degree than ever before.

The North Carolina State Department of Agriculture, provided for in the Constitution of 1876, has been, from the first, manned by an efficient group that has endeavored to carry out the purposes for which this Department was created and is maintained, namely, the protection of the farmers. There have been changes in the duties of the Department, from time to time, as ordered by the General Assembly, but its main objectives have remained the same. The Commissioner, elected by the people since the first of the century, is executive head of the Department, and is supported by a Board of outstanding men, acting in an advisory capacity and responsible for the passage of various regulations. At present the Board is composed of representative farmers drawn from the five leading branches of agriculture. One represents the truckers, one the cotton growers, one the tobacco growers, one the livestock farmers and one those engaged in general farming.

Since the last Biennial Report was issued one of the most efficient and esteemed members of the State Board of Agriculture has passed to his eternal reward. Reference here is to Hon. D. H. Bridgers, of Warsaw, who was held in deep affection by all his official associates as well as by the neighbors and friends in his section of the State.

The State Department of Agriculture is composed of the following divisions, each of which has furnished me with a report of its work for the past biennium, which is printed in full in this volume: Administrative, inspection, publications, markets, savings and loan, analytical, entomology, botany, pure food, crop statistics, museum, veterinary, test farms, warehouse, dairy, weights and measures. The Department also is responsible for the operation of the State Fair (under lease or directly) which will be referred to later.

Since 1925 the line of demarkation between the activities of the State Department of Agriculture and the North Carolina State College of Agriculture has been clearly drawn by legislation. I have lived up to this agreement, as expressed by the law that was passed. Today the Department does do teaching work, but it does maintain research and experimental work in the various agricultural sections of the State for the purpose of aiding the farmers, and this work is carried on in coöperation with the College and, in numerous projects, with the Federal Department of Agriculture, with which we also cooperate in crop reporting and other undertakings. The Depart-

ment's work is largely regulatory and has to do with livestock sanitation and other subjects in which the farmers, as well as the public in general, are so vitally concerned. These various detailed reports, referred to before and printed herein, will give a clear picture of all the Department's activities.

Through the Division of Entomology, the Department keeps the nurseries of North Carolina free from diseases, examines orchards and advises owners the best methods of treating diseases. This Division has to do with the control of crop pests in general.

The Botany Division is given over to the protection of farmers and seed dealers in getting the best stock and in the prevention of fraud or misrepresentation in the purchase and sale of same.

The Veterinary Division is designed to give protection against diseases of livestock by combatting spread of same, while the Dairy Division extends aid to the dairy interests of the State. The Food Division devotes its energies to the protection of the public along lines pertaining to pure and unadulterated food, drugs, etc. Through the work of the Weights and Measures Division, the Department has been able to accomplish much in the way of protecting the public against short measures in all commodities, as the detailed report will show, while the Statistical Division has gathered material that has been very valuable in determining facts and figures used as standard in agricultural calculations and computations.

The purpose of the Analytical Division is to analyze samples of fertilizers, feed and insecticides to keep the farmers from being defrauded and to aid the Commissioner in the proper enforcement of the law.

The Marketing Division extends aid to the farmers in helping them grade and dispose of their crops. Coöperation is maintained with the Federal Department through this Division, while the Warehouse Division maintains warehouses and supervises them for the benefit of our cotton farmers. Through the Publications Division the Department serves thousands of farmers each year, by issuing them information and publishing material designed to help them, the most largely circulated periodical being *Agricultural Review*, issued twice a month and mailed to approximately 10,500 farm addresses in the State. Through the Editor information is furnished the press.

The State Museum, a Division of the Department of Agriculture, is one of the highest ranking institutions of its kind in the

United States and is visited annually by several hundred thousand persons.

Through the Test Farm Division, a very detailed report of which is published in this volume, the Department of Agriculture coöperates with State College and the Federal Department of Agriculture in conducting experiments designed to aid our people in all the agricultural sections of the State. These farms—six in number and carefully located—belong to the Department.

No attempt has been made in this introduction to go into detail as to the work of the various Divisions of the Department of Agriculture, as the head of each Division has furnished his own report in full.

As stated in my last biennial report, the 1931 Legislature placed the State Fair in the Department of Agriculture, as one of its Divisions. It was provided that the Board of Agriculture should operate the Fair with the same powers that formerly were vested in the old State Fair Board. For the two successive years the Fair continued to operate without any operating deficit. The 1933 Legislature failed to make any appropriation for the Fair's continuance, but stipulated it could operate on its own receipts, providing that the Board of Agriculture could lease it, if it saw fit. That same year the Fair was leased to George Hamid, of New York, and the late Will H. Joyner, of Garysburg, N. C., who secured the services of Norman Y. Chambliss, of Rocky Mount, as secretary-manager. In 1934, the Fair was leased to Mr. Hamid and Mr. Chambliss and again in 1935. The State's operating profit in 1934 was \$2,645.56, and in 1935, it was \$10,556.

The lease effected with Messrs. Hamid and Chambliss which includes the 1936 Fair provides for the State to receive 15 per cent of the gross profits, with a minimum guarantee of \$8,000 a year for five years, a continuous bond of \$20,000 having been posted by Messrs. Hamid and Chambliss for the fulfillment of same. The Board of Agriculture, however, may terminate the lease by giving notice by February 1 of any year during the continuance of the lease.

A wing of the main building was destroyed by fire during the Fair of 1934. This has now been replaced. The new building itself cost \$23,475.41, while the plumbing cost \$1,943 and \$26.25 was spent for drawing plans, making a total of \$25,444.66. Of this amount, \$15,446.88 was received from insur-

ance on the former building, while the balance was available from Fair earnings. The amount now on hand in the Fair fund is \$4,000.

Some of the directors of the Western North Carolina State Sanatorium requested that the Mountain Test Farm, located at Swannanoa, be used to supply the Sanatorium with farm products, such as poultry, eggs, fruits and vegetables. I could not approve this, and the question was taken up with the State Board of Agriculture which, at a meeting held at Swannanoa, July 6, 1935, voiced its official action in the following resolution:

WHEREAS, After careful consideration and inspection of the area of land at the Mountain Test Farm, near Swannanoa, N. C., which is being considered by the Committee appointed by the Governor, as a site for the location of the proposed Sanatorium for Western North Carolina, the State Board of Agriculture hereby resolves:

a. That the Mountain Test Farm does not have sufficient land for handling the present program of work.

b. That a large portion of the land under consideration by the Committee is now devoted to experimental work and crop rotation studies which could not be moved without seriously handicapping the work of the Station.

c. That the location of the Sanatorium on the Mountain Test Farm land would defeat the purpose of the Mountain Test Farm, which is to serve by agricultural research work, the farmers of Western North Carolina.

The Board of Agriculture, therefore, does not approve of setting aside any part of the present Mountain Test Farm land for the proposed State Sanatorium.

During the past biennium, seizures for non-compliance with law were made as follows: Feed, 129; seed, 18; cotton seed meal, 11, and fertilizers, 18.

The Board of Agriculture recently adopted regulations which permit the sampling of fruit growing in orchards and its examination by a chemist of the State Department of Agriculture for arsenical residue. This fall numerous samples were taken and in some instances the arsenic and lead residues were found greater than the tolerance permitted by the United States Department of Agriculture. Fruit growers have in the meantime been advised to be more cautious in spraying their fruit another season, so as not to have an excessive amount of residue at harvest time.

At its last meeting, the Board requested the Commissioner to investigate the prices now charged for serum and virus used in the vaccination of hogs and see if same could not be reduced.

The Board also adopted a regulation instructing the Division of Botany to reduce the cost of legume cultures from 50 to 15 cents per acre. This is the actual cost.

The Board is composed of J. G. Staton, of Williamston; C. S. Young of Shelby; D. R. Noland, of Crabtree; T. G. Currin, of Oxford, and L. L. Stevens, of Indiantown. The terms of Messrs. Staton, Young and Stevens will expire May 21, 1937. It has been a genuine pleasure to work with these gentlemen who have, at all times, given me their hearty coöperation and displayed a spirit of real patriotism. Each has the welfare of his State at heart, and especially of the farmers of North Carolina.

DIVISION OF PUBLICATIONS

WILLIAM H. RICHARDSON

During the past biennial period, the work of the Editor of Publications has continued to expand, in that the demands for service have increased in scope. Through this office, most of the requests for information along various lines received by the Department are handled, such letters of inquiry amounting to several thousand annually. When the information sought can be supplied from material on hand, this is sent; and when it is necessary to call on other sources the information is thus secured.

The Editor has, from time to time, been in contact with other agencies designed to render public service, and has given co-operation whenever and wherever possible, by furnishing information, and also through the publication of information which, in his opinion, should be passed on to the rural public. Through the periodical known as *Agricultural Review*, which is published twice each month and circulates among more than ten thousand farm homes, articles have appeared telling of some of the activities and projects of the Rural Electrification Authority, the Resettlement Administration, the Works Progress Administration and other agencies. While there is no organic connection between the Editor's office and State College, an effort has been made to coöperate with State College officials, especially in that many of these have been on programs at the various Test Farms which have been given publicity through this Editor. Also, an effort is made at all times to coöperate with the public schools, especially those located in the rural districts.

In connection with that section of this report making reference to coöperation with the public schools, it may be stated here that last spring the Editor wrote, mimeographed, and made available for circulation, nearly five thousand copies of an information leaflet, in which the story of North Carolina, its resources, etc., is concisely told. More than two thousand copies of this leaflet have been distributed in coöperation with the State Department of Public Instruction, a thousand or more to teachers and students direct, while at this time there is still a number on hand which will be sent to anyone on application. The preparation of this information was necessitated because of the numerous requests received for the facts contained in the leaflet. Requests

for copies of this publication have come from libraries in Chicago, cities in Canada, etc., and from other Departments of Agriculture in various States.

Reference has been made to *Agricultural Review*. This publication was launched by the present Editor in 1926, with a mailing list of approximately 2500. The list now contains more than 10,000 names. This publication fills a peculiar need. On file are hundreds of letters from farmers, in which they state it is a useful publication. The praise of some has been exceedingly strong. For several years this publication consisted of a single sheet, printed on only one side. Then the demand for services became so heavy that it was necessary to convert it into a 4-page paper. This was done in the early spring of 1936. Each year the *Review* carries thousands of free notices from farmers who have material to sell and exchange. No charges are made for any notices, and every effort is made to discourage the sending in of notices by any who would be in a position to buy commercial advertising. At various times, letters have been received from farmers telling of specific instances where these notices resulted in definite benefits to them.

The Editor of Publications also prepares and issues to the press, for publication, news notices based on the activities of the Department, including crop reports, tobacco reports, etc., all of which are given out through this office, in coöperation with the various Divisions furnishing the material from which the stories are written. From time to time the Editor has been privileged to coöperate with the officials of the State Museum, a Division of the Department of Agriculture, in the publication of information about the Museum that has, according to every indication, increased attendance there and helped to enhance its popularity, as a show place for North Carolina's resources.

It is recalled here that, for several years, the Department of Agriculture maintained a regular broadcast schedule, once a week, over Station WPTF at Raleigh and, later, material was sent weekly to Station WBT at Charlotte. Each of the stations has assured the Editor that it will be glad at any time to resume such schedules as may seem expedient. It is recommended that this matter be taken up and that the Department again, in the future, undertake some broadcast schedule that will enable the Division chiefs and various workers to give the public, over the air, the benefit of their findings along various lines designed to aid the farmers. It would be—or, at least appear—expedient to use first the station at Raleigh and then expand the work to other stations over the State, if efforts seemed to warrant this.

Since the enlargement of *Agricultural Review*, for example, the Editor of Publications has been enabled to broaden the scope of information given the public through the medium of this paper. It is considered quite a compliment to this Department that the agricultural editors of the State Departments of Pennsylvania and New Jersey have patterned publications after the manner of *Agricultural Review*, which is sent not only to the various other State Departments in the United States, but also to numerous foreign countries, including points as far distant as Japan and Siam.

Due to the fact that the *Bulletin* had become irregular, it was necessary to change the stated frequency of this publication with the Post Office Department, in order not to affect its rating as a periodical mailed under second-class privilege. Tentatively, it was given in as a quarterly. It is recommended that various Division chiefs be requested to prepare and submit to the Editor material for the appearance of this publication at least quarterly—with regularity—and oftener as conditions warrant; but that *The Review*, due to the particular field it occupies, be continued as a semi-monthly publication. Through the use of this paper, much printing expense has been saved, in that the Department is enabled to use it for the publication of various items which, otherwise, it might be necessary to have printed in pamphlet form.

In addition to the above subjects covered in this report there have been many details which formed a part of the Editor's routine work, records of which may be found in various letters addressed to the Department.

DIVISION OF ENTOMOLOGY

R. W. LEIBY

This Division deals with the suppression and eradication of insects and diseases that affect plants and crops, and insects that affect man and animals. This work is done mainly through the inspection of plant nurseries, bulb growing establishments, native mountain plants and apiaries. The work of the Division also concerns the certification of plants for movement in conformity with State and Federal quarantine regulations, and general insect surveys. It includes coöperative programs with the Federal Bureau of Entomology and Plant Quarantine on Blister Rust Control, Phony Peach disease eradication, insect parasite introduction and similar projects.

The major activities of the Division were centered about the following projects during the past biennium.

NURSERY INSPECTION AND CERTIFICATION

A total of 170 nurseries growing approximately 1,536 acres of ornamental plants, shade trees, fruit trees and perennial flowerings plants were inspected and certified during each year of the biennium. An average of $1\frac{1}{2}$ inspections is made of each nursery each year, the general object being to locate an insect or plant disease outbreak in a nursery at its early onset and then to suppress or eradicate the infestation. The number of inspections ranges from one to four, of all or part of a nursery, the number and frequency depending upon conditions.

Most of the inspection work is done by two assistants during the months of July, August and September, although extra inspections are made during the fall, spring and winter shipping seasons when plants or trees are dug and stored in the packing shed.

Trees and shrubs, especially fruit stock, found infested in a nursery with such insects as San Jose Scale are cut down by the inspectors. A finding of a heavy infestation results in the refusal of certification of a nursery until the infestation has been adequately cleaned up and the nursery re-inspected. The movement of stock in parts of a nursery may upon occasion be forbidden or some of the stock may be ordered destroyed, the order being based upon the insect or disease concerned, and the type of plants involved.

As a result of this close inspection, it is felt that the nurseries in the State grow a better than average class of plants and trees. There is a continued close and pleasant relationship of the nur-

series in the State with the Division's personnel. In this connection it can be stated that the writer is secretary of an active State Association of Nurserymen.

The fees for inspection of a nursery are:

Three acres or less.....	\$ 5.00
Four to ten acres.....	7.50
Eleven to fifteen acres.....	10.00
Sixteen acres	12.50
and 10c for each additional acre.	

During the first half of the biennium \$1,132.40 were collected in inspection fees, and \$1,108.80 were collected in the second half. The receipts have been duly examined by the State Auditor and accounted for to the Chief Clerk.

NATIVE PLANT COLLECTORS PERMITS

The annual fee for a permit to collect and sell wild native plants including boxwood is \$10.00. A total of 15 permits were issued for the shipping season 1934-1935 and 18 permits for the season 1935-1936.

Approximately 300 carloads of native plants such as Rhododendron, Azalea, Kalmia, Leucothea and other dwarf native plants were collected and shipped from this State to other states and to foreign countries during each year of the biennium. In addition, many truck loads of such plants and boxwood are transported to other states each year. A fair percentage of these plants is inspected prior to movement, so that for the most part, only strong healthy and disease-free plants are being moved. Provisions should be made for the inspection and certification of all native ornamental plants that are collected and shipped to points within or without the State.

A special shipping tag is supplied to individuals who wish to make an occasional small shipment of native plants.

NURSERY STOCK DEALERS' PERMITS

During the plant shipping seasons of 1934-1935 and 1935-1936, ten and seven dealers' permits respectively were issued. The annual fee for such a permit is \$2.00.

Dealers' permits are issued to individuals or companies who purchase and resell nursery stock, after they have agreed to purchase only certified plants. There are numerous violations of the regulations of the State Department of Agriculture in this

connection. Funds should be made available so that the Division could better prevent the fraudulent sale of uncertified plants and trees by peddlers in violation of nursery regulations and quarantines.

BULB INSPECTION AND STERILIZATION

There are thirty commercial growers of flowering bulbs in the State. These grow millions of narcissus, iris and tulip bulbs mainly for the cut flower industry. The State is one of the leading shippers of flowers grown from bulbs in the Union. There is also an increasing industry in the growing of narcissus and other bulbs for sale in this and to other states.

Regulations enforced by the Department of Agriculture require that narcissus plantings be inspected annually, once after the bulbs have flowered, and again after the bulbs are dug. The second inspection is required only if the grower wishes to move or ship any narcissus bulbs. The regulations also require that narcissus bulbs imported from abroad, or from other states, which bulbs have been found upon inspection to be infested with the narcissus eelworm, *Anguillulina dipsaci*, must receive the hot-water treatment before they may be planted. If infested with the narcissus fly, *Merodon equestris*, they must be given an approved fumigation treatment. The treatments are given under the direct supervision of an assistant in the Division.

The two narcissus pests referred to are not widely distributed in our bulb-growing districts. Only three narcissus plantings are infested with the eelworm, and the infestations are light and being cleaned up. There is only one infestation of the bulb fly and this is located in Brunswick County. There is a strong desire on the part of our bulb growers to suppress narcissus bulb pests, if not indeed to eradicate them, and their coöperation with the Division in this respect is commendable.

Fees for the inspection of narcissus plantings vary with the acreage inspected for a grower. They range from \$5.00 to \$14.00. In 1935 the fees amounted to \$115.00. In 1936 the total of the inspection fees was \$110.00.

INSPECTION OF IMPORTED NARCISSUS

In conformity with Federal quarantines, narcissus bulbs may be imported from foreign countries only upon permit and with the understanding that they must be inspected before they are released to the importer. If found infested with pests, either a

hot water treatment or a calcium cyanide fumigation must be given under the supervision of our inspectors—the treatment depending upon the pest found in the bulbs.

The number of narcissus bulbs imported during the biennium, and inspected and treated by Division workers is as follows:

	Total number bulbs inspected	Number bulbs fumigated	Number bulbs hot water treated
Year 1934	75,472	69,472	6,000
Year 1935	87,400	77,400	10,000

INSPECTION OF NARCISSUS PLANTINGS

An annual inspection of commercial plantings of narcissus is made when requested by the grower just after the blooming period. Ninety per cent of the growers request this inspection, and pay the fees referred to above, so they can keep informed of the initial appearance or expansion of pest conditions in their plantings. This tedious and somewhat exacting type of inspection is made during April and May by two of our workers. The following inspections and findings were made in this connection during the biennium:

Year	Acres bulbs inspected	Number properties inspected	Properties infested with eelworm	Properties infested with narcissus fly
1935.....	70.26	18	3	1
1936.....	59.00	18	3	1

The 70.26 acres inspected in 1935 included an estimated total of 4,133,000 bulbs. The 59 acres examined in 1936 included approximately 3,540,000 bulbs. At least one man-day is required to inspect one acre of bulbs.

Of the three plantings found infested with eelworm in 1935, one showed a light infestation in only one variety of bulbs and this infestation was promptly eradicated. A similar procedure was followed in one moderately infested planting found in 1936. Active efforts are being made leading toward eelworm eradication or suppression in the remaining two plantings now known to be infested.

The larger narcissus plantings are located in Brunswick, New Hanover, Pender and Beaufort counties. Smaller and single commercial plantings are located in Lee, Durham, Buncombe and Columbus counties.

INSPECTION OF NARCISSUS OFFERED FOR SALE

A second inspection is made of lots of domestic bulbs which some of our growers desire to sell. This inspection, known as the storage inspection, is made in September after the bulbs are

matured and dug. In 1934, a total of 2,000,000 bulbs were inspected and certified for sale as free of pests. In 1935, a total of 1,454,000 such bulbs were certified. Bulbs must be found free of pests at the post-flowering inspection as well as the storage inspection in order to be certified for movement.

SUPERVISION OF DOMESTIC BULB TREATMENTS

When bulbs are found infested with eelworm or the narcissus fly and the grower is ordered to clean up an infestation, or wishes to do so, the inspector supervises in person the hot water treatment or the fumigation process. In 1934, supervision was given to the hot water treatment of 171,300 bulbs, and to 15,000 bulbs that were fumigated. In 1935, a total of 204,000 bulbs were given the hot water treatment under our supervision.

DUTCH IRIS IMPORTATIONS AND TREATMENTS

Our commercial bulb growers import many Dutch Iris bulbs each autumn for the growing of cut flowers sold in eastern and northern markets in winter and spring. If these are found infested with the eelworm upon arrival at the port of entry, they must be given an approved hot water treatment.

In 1934, a total of 106,000 iris bulbs were inspected upon arrival in this State. Of these, 16,000 were found eelworm infested and were given the hot water treatment under our supervision.

In 1935, a total of 412,000 iris bulbs were imported. These were all inspected by Federal inspectors, and the hot water treatment was required of 334,000 of these bulbs before they were released to our growers. Workers in this Division have occasion to watch the growth of hot water treated iris, since this method of control of the eelworm in the small iris bulbs often affects the flowering of the bulbs adversely.

APIARY INSPECTION

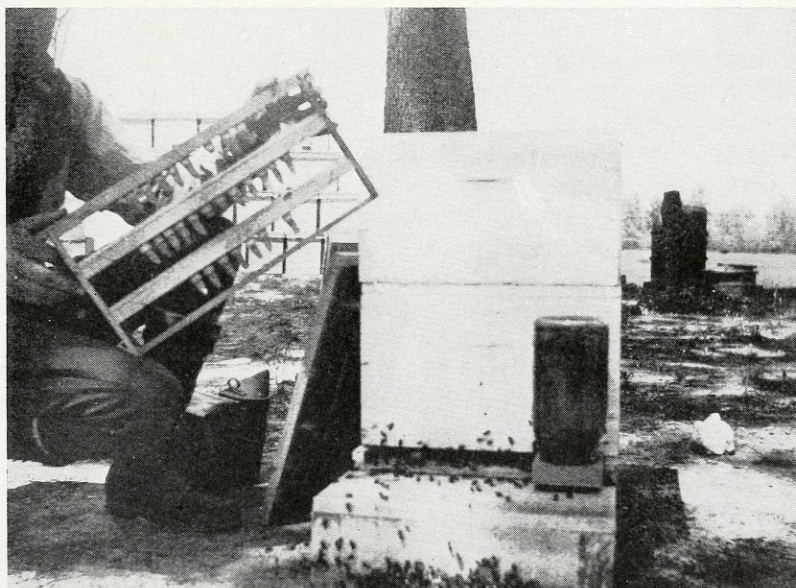
The Division inspects in May of each year the apiaries where queen bees are grown for sale to see that they are free of foul brood or other diseases. Six such apiaries containing 208 colonies and six apiaries containing 169 colonies were inspected and certified respectively in 1935 and 1936.

Occasional inspections of apiaries for disease are made upon request of large beekeepers when there is opportunity to do this work, and when the presence of foul brood is suspected. A total of 280 out of 567 colonies were inspected for a bee keeper



QUEEN BREEDING APIARY OF CAROLINA BEE COMPANY, GRAHAM, N. C.

Photo by D. L. Wray.



HIVE FOR RAISING QUEEN BEES. NOTE ELONGATED QUEEN CELLS ON FRAME.

Photo by D. L. Wray.

in Columbus County in 1934 and 1935, and 62 out of 95 were inspected for a bee keeper in Pender County in 1935. Such periodic inspections are helpful in suppressing foul brood in the large commercial apiaries.

Regular inspections of apiaries followed by compulsory and systematic disease eradication should be a part of the program of this Division, and provision should be made for this work by the appointment of a full-time apiary inspector. The honey producing industry of the State is of such magnitude as to justify the services of an assistant in this Division who would render desired services in bee disease eradication. The outbreak of Parafoolbrood referred to in the last biennial report is cited as a phase of bee culture which needs the urgent attention and assistance of the Department of Agriculture.

JAPANESE BEETLE SURVEY AND QUARANTINE

As stated in the last biennial report, traps placed in 25 cities and towns in the State caught beetles in the summer of 1933 in 20 of the 25 municipalities. In 1934 no traps were placed in the State by the Federal or State Departments of Agriculture.

In 1935, a coöperative arrangement was made through this Division with the Federal Bureau of Entomology and Plant Quarantine, to place a total of 7,900 beetle traps in 41 localities. Traps and baits and some supervision were furnished by the Federal Bureau, this division directing the work and securing ERA labor to examine the traps daily and report the catch. All beetles suspected of being the Japanese beetle were carefully identified by entomologists of the Federal Bureau.

Beetles were taken in 16 cities and towns in the State during June and July of 1935. A total of 219 beetles were caught in the traps. These were distributed as follows: Charlotte 8 beetles, Durham 4, Goldsboro 1, Greensboro 13, Henderson 2, High Point 1, Lumberton 1, Oxford 1, Raleigh 10, Rocky Mount 6, Salisbury 5, Sanford 2, Spencer 54, Statesville 1, Wake Forest 1, and Winston-Salem 109.

Negative trapping records were secured in Asheboro, Asheville, Concord, Dunn, Elizabeth City, Fayetteville, Franklinton, Gastonia, Greenville, Hendersonville, Kinston, Lexington, Mooresville, Mt. Airy, New Bern, Norlina, Reidsville, Shelby, Tarboro, Thomasville, Warrenton, Wilmington and Wilson during 1935, although beetles were trapped in some of these towns in 1933.

The capture of 109 beetles in Winston-Salem, 13 in Greensboro and 54 in Spencer required the promulgation of Quarant-

tine No. 3 by the State Board of Agriculture governing the movement of plants, sand, soil, earth, peat, compost and manure from these cities into other parts of the State. The State was not included in part or as a whole in the Federal quarantine on the Japanese beetle because of this action taken by the Board of Agriculture. The following quarantine and regulations were adopted by the Board on April 2, 1936.

QUARANTINE No. 3

THE JAPANESE BEETLE

It having been determined that an infestation of the Japanese beetle (*Popillia japonica*) exists in portions of the cities of Greensboro, Salisbury, Spencer and Winston-Salem, the Board of Agriculture enacts the following regulations in compliance with the requirements of an act of the General Assembly (Ch. 84, C. S. 1919), thereby providing for the suppression or eradication of this infestation and to prevent its spread to uninfested parts of the State.

Regulation 1. Infested areas—Townships of Broadbay, Middle Fork, Old Town, South Fork and Winston-Salem in *Forsyth County*; townships of Morehead and Gilmer in *Guilford County*; and the township of Salisbury in *Rowan County*.

Regulation 2. No nursery, ornamental, or greenhouse stock, or other plants, plant roots, or sand, soil, earth, peat, compost, or manure, shall be transported in any manner from the said infested areas to or through any other part of the State of North Carolina, unless a special permit shall have been issued therefor by the North Carolina Department of Agriculture.

Regulation 3. Such permits will be issued only on condition that the articles to be transported have been freed from soil or any other material which could transport the Japanese beetle, or that such soil or other material has been sterilized or otherwise treated to eliminate said infestation.

Regulation 4. The Commissioner of Agriculture and deputies working under his direction are authorized to apply such treatments to plants or soil within the infested areas and to set up such beetle traps either inside or outside the infested areas as may in their judgment be necessary for the suppression of the Japanese beetle and for the determination of its distribution.

Regulation 5. The regulated areas shall be extended when in the opinion of the Commissioner of Agriculture it has been ascertained that the infestation by the beetle is such as to warrant the extension.

These rules and regulations shall be effective upon adoption by the Board of Agriculture.

Adopted April 2, 1936.

(Signed) WILLIAM A. GRAHAM, *Commissioner*.

On June 1, 1936, Mr. J. Thomas Page was appointed assistant in this Division to enforce the Japanese beetle quarantine, and to supervise the trapping work in the quarantined areas for the season 1936.

JAPANESE BEETLE SURVEY IN 1936

In coöperation with the Federal Bureau of Entomology and Plant Quarantine, traps were placed in 28 cities and towns during June, July and early August to ascertain in part the intensity of the infestation by this insect. Supervision of the traps in the quarantined areas was maintained by this Division. The Bureau of Entomology and Plant Quarantine placed and maintained the traps in the non-quarantined cities.

The trapping records indicate that 15 of the 28 cities trapped are infested with the beetle. The following municipalities yielded beetles: Asheville 1, Burlington 1, Charlotte 5, Durham 1, East Spencer 40, Elizabeth City 1, Greensboro 15, High Point 2, Raleigh 2, Rocky Mount 6, Salisbury 3, Spencer 28, Wilmington 2, Wilson 1 and Winston-Salem 37. A total of 145 beetles were captured which is 74 less than in 1935. Negative trapping records were procured for Concord, Fayetteville, Gastonia, Goldsboro, Henderson, Kinston, Lumberton, North Wilkesboro, Sanford, Shelby, Statesville, Thomasville and Wake Forest. These negative records do not necessarily mean that beetles are not present and developing in some numbers in these cities. It is thought that the rather severe winter of 1935-1936 may have retarded the increase in numbers of the beetle, by killing the grub stage in the ground.

The number of beetles trapped in cities in the quarantined area in the summer of 1936, justifies the continuation of Quarantine No. 3 in the regulated areas listed in the quarantine order. A bulletin describing in brief the habits of the beetle and its life history, and explaining the conditions under which plants and other regulated articles can be moved from within the quarantined area has been prepared as the September 1936 Bulletin of the State Department of Agriculture.

CONTROL OF TUBEROSE NEMATODE AND MITE

There is great difficulty in producing tuberose in Duplin County, where a vast majority of these bulbs are grown for shipment to other states and foreign countries, because of the nematode (*Heterodera mariani*) and to some extent because of the bulb mite (*Rhyzoglyphus hyacinthi*).

Tuberose bulbs must always be culled severely before they can be certified for movement as reasonably free from these pests. It was considered desirable therefore to find a treatment for the bulbs which would kill the pests infesting them and at the same time put unshipped bulbs in cleaner condition for planting.

In coöperation with the Federal Bureau of Entomology and Plant Quarantine and John F. Croom & Company of Magnolia, this Division began tests in 1934 with the hot water and vapor treatments, known to be effective in the control of nematode in narcissus, to ascertain how the nematode and bulb mite could be eliminated.

Field plantings were made each year using tuberose infected with eelworms. Some lots were treated by hot water of different temperatures for varying periods of time before planting. Other lots were vapor heat treated for one hour. The bulbs were planted in a series of plats. Blooming sized bulbs were used in 1934 and seed bulbs were used in 1935. The field plats at Magnolia were supplemented by small greenhouse plantings made at the Arlington Farm of the Federal Department of Agriculture.

The results of these tests are summarized as follows in a recently published article:* "Small-scale tests during 1934 have shown that tuberose bulbs in hot water at 110° F. for one hour, or with vapor heat at 114° F. for one hour, is completely effective against all stages of the bulb mite. The treatments that were found to be effective against the root-knot nematode—hot water at 116° F. for one hour, 118° F. or above for one-half hour, and vapor heat at 122° F. for one-half hour—are therefore also effective against the bulb mite. Tolerance tests with both types of treatments at the temperatures and durations herein indicated have shown that the dormant bulbs of either the flowering size or planting stock are not adversely affected, and the application of treatments on a commercial scale is practical."

Tests to work out minor details are being continued. As the result of the work thus far reported upon, safe and effective treat-

* Heat Treatments for Control of Bulb Mite on Tuberose," by C. A. Weigel and R. H. Nelson. In *Journal Economic Entomology*, Vol. 29, No. 4, August, 1936, pp. 744-749.



COMPARISON OF VAPOR-HEATED TUBEROSE BULBS (ON LEFT) AND CHECK-NO TREATMENT (ON RIGHT). NO BULBS WERE PLANTED IN THE CENTER SPACE. TUBEROSE BULBS MAKE FAR BETTER GROWTH AFTER PLANTING WHEN THEY RECEIVE THE HOT WATER OR VAPOR HEAT TREATMENT TO KILL NEMATODES AND MITES.

Photo by C. A. Weigel, U.S.D.A.

ments of tuberose can now be required before these bulbs can be moved without pest risk to points within this State, to other states or to foreign countries.



COMPARISON OF GROWTH OF TUBEROSE BULBS. BULBS IN ROWS ON LEFT WERE HOT WATER TREATED TO KILL NEMATODES AND MITES. THOSE IN THE RIGHT-CENTER WERE UNTREATED.

Photo on John F. Croom place near Magnolia by Dr. C. A. Weigel, U.S.D.A.

CERTIFICATION OF FIELD BULBOUS STOCK

In addition to the regular fall inspection of field bulbous stock which includes tuberose and caladium bulbs, and canna roots, the Division is called upon to inspect and certify this class of stock immediately before packing when it is destined to foreign countries. During the shipping seasons of the biennium the following numbers of these bulbs and roots were certified for movement by special inspections to Holland, Germany and Canada:

	Shipping Season 1934-1935	Shipping Season 1935-1936
Canna.....	92,325 roots	179,050 roots
Tuberose.....	97,750 bulbs	76,650 bulbs
Caladium.....	26,700 bulbs	23,400 bulbs

The field bulbous stock referred to is grown largely in Duplin County in the vicinity of Magnolia and Rose Hill.

PHONY PEACH ERADICATION

As indicated in the last biennial report, a small number of peach trees infected with the phony disease were found in the State. The phony disease of peach trees is regarded as a serious disease. It has destroyed hundreds of thousands of peach trees in the commercial peach section of Georgia, many trees in Alabama and Mississippi and to a lesser extent some trees in Tennessee, South Carolina and a few other states. It has appeared desirable, therefore, for this Division to coöperate with the Federal Bureau of Entomology and Plant Quarantine, to make further surveys of, first, the commercial peach orchards of the State for phony infected trees; second, to inspect all peach trees for the disease that are growing within a radius of one mile of nurseries that grow and sell peach stock; third, to inspect all commercial and larger home peach orchards; fourth, to remove all infected trees found, and fifth, to remove all abandoned diseased and escaped peach trees in the State as a means of reducing the possibility of peach insect and disease transmission to healthy and cared-for trees, and thereby reduce the hazard of the spread of phony disease in the State.

In following this program during the years of 1935 and 1936, this Division has had the assistance of two inspectors supplied by the U. S. Department of Agriculture in 1935 and a Federal WPA appropriation of approximately \$55,000.00 for the period of September 30, 1935, to June 30, 1936. In this coöperative program, workers of this Division have materially assisted in the field work by doing actual inspection work and supervising field crews of inspectors, and by directing the work as a whole in this State.

It should be stated that the work in this State is a part of an extensive Federal WPA project, directed by Messrs. B. M. Gaddis and A. E. Cavanagh of the Federal Bureau of Entomology and Plant Quarantine. The project includes eleven states in which the phony disease of peach trees is known to occur.

It would appear that the work on this project in this State should be the means of eradicating the very small amount of phony disease of peach trees in North Carolina, and reduce very materially the constant spread of insects and other diseases from abandoned, escaped and uncared-for peach trees to healthy trees that are usually well cared for and sprayed.

PHONY PEACH SURVEY OF 1935

Home Orchards

The work in 1935 included a survey* of home orchards and of escaped trees in thirteen counties in which it was felt that the phony disease might be found if it were present in the State. The following table shows the results of the survey by counties.

COUNTY	Number Properties Inspected	Number Properties Phony	Number Trees Inspected	Number Trees Phony
Anson.....	325	17	1,090	22
Buncombe.....	11	0	44	0
Burke.....	51	0	674	0
Caldwell.....	19	0	200	0
Catawba.....	442	1	6,421	1
Cleveland.....	132	0	1,291	0
Gaston.....	57	0	468	0
Guilford.....	26	0	256	0
Lincoln.....	9	0	183	0
McDowell.....	35	0	190	0
Mecklenburg.....	30	1	198	1
Randolph.....	25	0	256	0
Union.....	50	0	315	0
Totals.....	1,212	19	11,586	24

Phony trees were found only in Anson (22 trees), Catawba and Mecklenberg (1 tree each) counties. All of the phony trees were subsequently removed.

* This survey was conducted by Messrs. Breland and Etheridge of the Federal Bureau of Entomology and Plant Quarantine working under Mr. W. F. Turner, and by Messrs. Wray and Harris of the N. C. Department of Agriculture.

Commercial Orchards

A survey was made of some of the commercial peach orchards in 23 counties for the phony disease, to ascertain whether there was any initial outbreak of the disease in the large orchards. Most findings of the disease in the past in the State were in home orchards. The findings and the orchards inspected are given in the following table.

COUNTY	ORCHARDS			TREES		
	Total Number	Number Inspected	No. Showing Phony Peach	Total Number	Number Inspected	No. Showing Phony Peach
Anson.....	15	1	1	37,745	1,800	5
Caldwell.....	5	1	0	12,965	3,500	0
Catawba.....	6	6	0	6,072	6,072	0
Cleveland.....	2	2	0	2,875	2,875	0
Cumberland.....	8	....	..	42,300	.....	..
Forsyth.....	1	....	..	4,722	.....	..
Gaston.....	5	1	0	10,510	445	0
Guilford.....	2	....	..	6,196	.....	..
Harnett.....	4	....	..	24,000	.....	..
Hoke.....	8	....	..	50,000	.....	..
Iredell.....	2	1	0	2,100	1,400	0
Lee.....	1	....	..	7,500	.....	..
Lincoln.....	2	2	0	1,600	1,600	0
Mecklenburg.....	2	....	..	770	.....	..
Montgomery.....	46	1	0	269,485	5,000	0
Moore.....	93	6	0	519,788	54,200	0
Randolph.....	1	....	..	1,250	.....	..
Richmond.....	78	1	0	523,975	3,400	0
Robeson.....	4	....	..	3,600	.....	..
Rutherford.....	3	....	..	9,700	.....	..
Scotland.....	16	....	..	100,800	.....	..
Surry.....	7	....	..	15,900	.....	..
Wake.....	4	....	..	23,495	.....	..
Totals.....	315	22	1	1,677,348	80,292	5

As indicated in the table only 5 phony trees were found in commercial orchards out of 80,292 trees actually inspected. These were found in Anson County, where most of the phony trees found in home orchards were located. All phony trees were destroyed.

NURSERY ENVIRON INSPECTION (1935)

In view of the possibility of transmission of the phony disease by the peach tree-borer, it was considered desirable to inspect for the disease all peach trees that were growing within a radius of one mile of a nursery that grew and sold peach stock. Such inspections were made in 1935 in Catawba, Guilford and Randolph counties. The properties inspected were those in the vicinity of the Catawba Nurseries, Howard-Hickory Co., Killian

Nursery, Newton Nursery and the North State Nurseries. These grew in 1935 approximately 419,000 peach trees. A total of 482 properties were inspected and these included 6,716 peach trees.

Only one phony tree was found within a radius of one mile of a nursery—the Catawba Nurseries. This tree was destroyed.

PEACH STOCK INSPECTION

The finding of this one phony tree within one mile of the Catawba Nurseries necessitated a tree-by-tree examination of all peach stock (26,965 peach, 100 apricot, 1,500 plum) growing in the nursery for the peach tree borer. This inspection was made by Mr. J. A. Harris of this Division in early winter after the stock was dug. Approximately 20 per cent of the stock had to be culled out because of infestation by the borer.

ABANDONED PEACH TREE REMOVAL

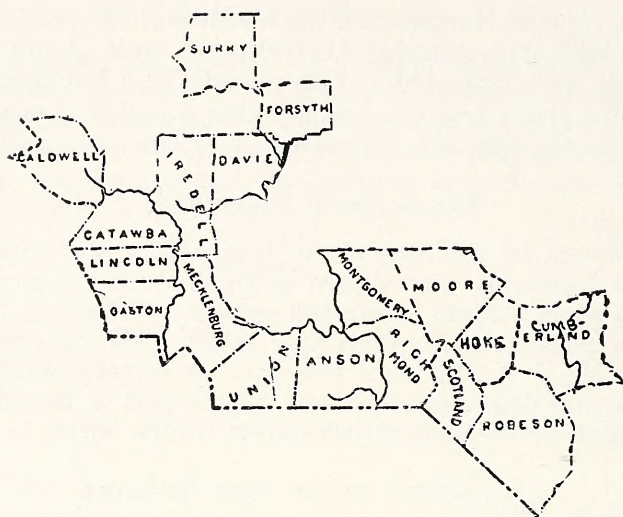
(September, 1935, to June 30, 1936)

As stated above, a Federal WPA project with an allotment of approximately \$55,000 was begun in the State in late September of 1935 to remove abandoned peach orchards, and scattered and escaped peach trees, as a means of lessening the chances of infection of cared-for trees by the phony disease, other diseases and injurious insects.

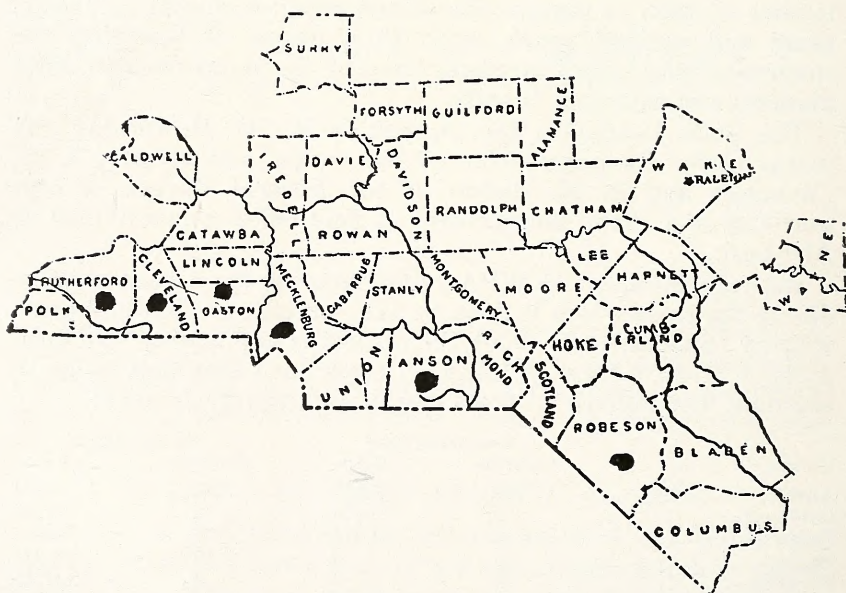
The State Leader in this project is Mr. C. H. Hearn, who works under the supervision of the writer and Messrs. A. E. Cavanagh and B. M. Gaddis of the Federal Bureau of Entomology and Plant Quarantine. A field office is maintained at Aberdeen.

Between 50 and 175 WPA relief laborers have been used to dig up the trees which is done by axe, mattock or shovel. At this writing (September 1, 1936) the project is still active. Up until June 30, 1936, a total of 1,020,777 trees have been dug up in 15 counties. The number of trees dug in each county follows:

COUNTY	ABANDONED TREES		ESCAPED TREES	
	Properties	Trees	Properties	Trees
Anson.....	184	7,937	82	6,104
Caldwell.....	0	5,478	10	97,133
Catawba.....	7	31,415	17	72,814
Davie.....	0	0	16	41,334
Forsyth.....	0	0	0	5,718
Gaston.....	0	0	214	21,674
Hoke.....	84	29,311	154	51,829
Iredell.....	0	0	0	7,251
Mecklenburg.....	30	864	259	19,825
Montgomery.....	22	20,894	409	118,698
Moore.....	77	116,669	135	88,488



COUNTIES IN WHICH ABANDONED AND ESCAPED PEACH TREES HAVE BEEN REMOVED TO AUGUST 8, 1936. THE WORK IS NOT COMPLETE IN ALL THE COUNTIES SHOWN.



COUNTIES IN WHICH COMMERCIAL AND HOME PEACH ORCHARDS WERE INSPECTED IN 1936 FOR PHONY TREES. THE COUNTIES WITH SOLID BLACK DOTS ARE THOSE IN WHICH PHONY PEACH WAS FOUND. DATA ON THE MAP INCLUDES ALL INSPECTION WORK TO SEPTEMBER 4, 1936.

COUNTY	ABANDONED TREES		ESCAPED TREES	
	Properties	Trees	Properties	Trees
Richmond.....	55	90,187	109	343,632
Scotland.....	20	32,032	39	92,644
Surry.....	0	0	9	37,910
Union.....	28	246	186	15,723
Total 15 counties.....	507	335,033	1,639	1,020,777
Total properties with trees removed, 2,146.				
Total number trees removed, 1,355,810.*				

* It may be noted here that a total of 1,708,331 trees have been removed to October 31, 1936, in 18 counties.

ORCHARD INSPECTION IN 1936

Inspections of both home and commercial peach orchards for phony trees were made beginning May 4, 1936, by six inspectors working under WPA funds and supervised by J. A. Harris of this Division. The inspections were made in 19 counties, selected because they grow peaches commercially or because they are close to counties in which the phony disease was found in past seasons. The following table lists by counties the number of trees inspected and the number of phony trees found. The inspection includes all peach trees growing within a radius of one mile of nurseries in the counties which grow peach (both fruit and flowering) plum and apricot stock.

COUNTY	Number Properties Inspected	Number Properties Phony	Number Trees Inspected	Number Trees Phony
Alamance.....	101	0	2,451	0
Anson.....	1,042	13	62,172	19
Caldwell.....	5	0	12,300	0
Catawba.....	788	0	8,474	0
Chatham.....	46	0	283	0
Davidson.....	1	0	810	0
Davie.....	392	0	4,601	0
Forsyth.....	5	0	10,990	0
Gaston.....	6	0	15,117	0
Guilford.....	149	0	11,979	0
Hoke.....	7	0	17,435	0
Iredell.....	2	0	1,750	0
Mecklenburg.....	4	0	1,305	0
Montgomery.....	26	0	74,247	0
Moore.....	80	0	305,487	0
Randolph.....	39	0	470	0
Richmond.....	80	0	417,285	0
Scotland.....	12	0	87,700	0
Surry.....	13	0	23,500	0
Total 19 counties..	2,798	13	1,058,356*	19

* Up until September 15, 1936, a total of 1,543,393 trees were inspected in 35 counties and a total of 161 phony trees were found.

All phony trees had not been removed by June 30. Plans are under way to dig up all infected trees before October 1, 1936.

GENERAL DISCUSSION—PHONY DISEASE CONDITIONS

The inspection work has revealed to August 15, 1936, the presence of phony disease in seven out of 31 counties inspected. The chief counties in which the disease has been located are Anson, Cleveland and Robeson. The disease thus far appears to be confined primarily to home orchards.

There are approximately twelve more counties in which abandoned and escaped trees should be removed systematically as a means of reducing the possibility of phony disease infection. Plans for this work have been made, and the work is under way. They will be consummated if funds continue to be made available.

The orchards in which phony disease has been found should be inspected again for one or two years, and with negative findings, the phony disease may then be considered as eradicated from the State.

More detailed records on this project are on file in the office of the entomology division of this Department and in the Atlanta office of the Federal Bureau of Entomology and Plant Quarantine.

ORIENTAL MOTH PARASITE DISTRIBUTION

This Division coöperates with the Moorestown, N. J., parasite station of the Federal Bureau of Entomology and Plant Quarantine in a project to establish a natural control of the Oriental fruit moth which is a pest of peaches in this State. The object is to liberate in peach orchards, insect parasites introduced from foreign countries. These parasites are known to destroy stages of the Oriental moth.

In the summer of 1934, nineteen colonies of 3,743 parasites were supplied by the Moorestown laboratory and released in peach orchards. Most of the liberations were made by Division workers. The parasites included five species of wasps whose native home is Japan. They were released in Gaston, Moore, Montgomery, Richmond and Wake counties.

Six collections of 462 twigs infested with Oriental moth larvae were made during June and July of 1934. Only one specimen of one species of parasite was recovered by being reared from the twigs collected. Hence, efforts to effect an insect parasite control of the Oriental moth in this State in 1934 were a failure.

In 1935, seventeen releases of 9,398 parasites were made in the same counties in which releases were made in 1934. These included eight species of parasite wasps, some native to the United States and others of foreign origin.

Seventeen different collections of peach twigs infested with larvae of the Oriental moth were made. These numbered 3,026 twigs. They were sent to the Moorestown, N. J., laboratory for the rearing of any parasites the larvae might contain. There were bred from these, 35 specimens of *Macrocentrus ancylivorus* which species was released in rather large numbers during the two summers of 1934 and 1935. Very small numbers of four other species of parasites were bred.

The failure of these introduced parasites to establish themselves in the orchards in which they were released during the two-year period is not understood. It is thought that the parasites have not been able to find other host insects in which to breed and develop in the seasonal absence of specimens of the Oriental moth. The absence of such other host insects might be attributed to a restricted flora of the Sandhill section of the State, or perhaps to the clean cultivation of orchards that is practiced which would naturally reduce the flora of an orchard.

The parasite introduction work to aid in the natural control of the Oriental fruit moth is being continued. The parasitic control of this peach pest is desirable since it is almost impossible to control this insect by sprays or other artificial means.

WHITE PINE BLISTER RUST PREVENTION

An extensive coöperative program to prevent infection of white pine trees in the State by removing *Ribes* bushes was inaugurated by this Division with the Federal Bureau of Entomology and Plant Quarantine in April, 1934. The project was reported upon in brief in the last biennial report. The work is now a Federal WPA project and is still active. The State Department of Agriculture contributes to the project in various ways, but chiefly through rather close supervision of the work by the writer and the contribution of a limited amount of funds.

This project was initiated with NIRA funds. It was continued with ERA funds effective July 25, 1935, with an appropriation of approximately \$33,000 for this State for eleven months. It was continued further on July 1, 1936, with an allotment to the State of a WPA fund of about \$98,000 applicable to a subsequent twelve months period. The work in this State is a part of a Federal project on Blister Rust control which includes many states in which white pine trees grow. The entire extensive Federal project is under the direction of Dr. S. B. Fracker and Mr. Roy G. Pierce, of the Federal Bureau of Entomology and Plant Quarantine.

The project employs from 60 to 168 relief laborers, the number depending upon the seasons in which wild and cultivated

currant and gooseberry bushes (*Ribes*) can be pulled effectively. Removal of these bushes will prevent the development of the Blister Rust of white pine trees, since the alternate host of this disease must develop upon species of *Ribes* before it can infect



WHITE PINE TREES REACH IMMENSE SIZE IN WESTERN NORTH CAROLINA. COMPARE TREES WITH AUTOMOBILE SHOWN BELOW NEAR THE CENTER. ROYAL PINES, NEAR ASHEVILLE.

Photo by H. B. Teague, U.S.D.A.

white pine trees. This disease is not known to occur in North Carolina, the nearest known point of infection being in Virginia.

Headquarters for the BRC work in this State are maintained in the county court house in Asheville. Since November 1, 1934, the State Leader in this work has been H. B. Teague.

The general plan of the work includes the defining of what are regarded as white pine areas, the scouting for Ribes bushes within such areas and for a radius of 900 feet around the white pine areas, and the removal of all Ribes bushes (currant and gooseberry, both wild and tame) from within the areas and the 900 foot radius surrounding them.

The work is done by counties, including all the counties defined in the Blister Rust control area of the Department's State quarantine effective January 23, 1935. Accurate maps are prepared for each county showing the white pine areas, the location of scattered white pine trees, and the location and removal of Ribes bushes in relation to white pine. Records are kept of the number of Ribes bushes removed, the species concerned and the owners of the land from which the bushes are removed.

It has been found necessary to revisit a year later places from which Ribes bushes have been removed, to ascertain whether any bushes have been overlooked at the initial eradication, or to pull any sprouts which have developed from seed or roots in the meantime. Records are kept of all interviews held with owners of bushes.

The work accomplished under this project is referred to in brief below. Full and detailed reports, which include maps, photographs and data in tabulated form, are on file in the office of this Division and in the Asheville office of the Blister Rust Control project. Reference is made here only to summaries of the progress of the project.

PRE-ERADITION OF RIBES TO DECEMBER 31, 1935

A pre-eradication survey of a county is always made before Ribes bushes are removed. The survey includes the establishing of areas with natural boundaries in which white pine is growing, an estimate of the acreage of white pine that is worth working within each area, and a determination of whether wild or cultivated Ribes bushes are growing close to or among white pine trees. Only acreages which show 5% or more of pine are considered important enough to have the Ribes bushes removed. An exception is made in the case of cities and towns where there is much valuable white pine because of its ornamental use. In these places all bushes are removed.

A summary of the pre-eradication surveys in 1935 is as follows:

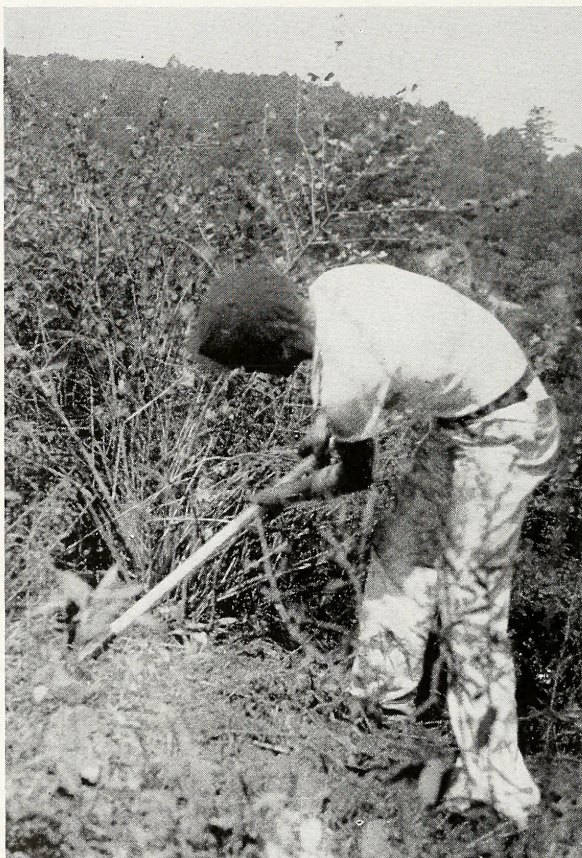
Number counties in which surveys were made.....	11
Number acres white pine needing protection.....	249,307
Number acres needing Ribes removal.....	335,901

SUMMARY OF ERADICATION WORK IN 1935

In addition to the pre-eradication work there was active initial eradication of *Ribes* done in 15 counties. A summary of this work is as follows:

Number of counties with active eradication.....	15
Acres of white pine protected.....	268,574
Total white pine and protective acres worked.....	588,360
Total <i>Ribes</i> bushes pulled.....	267,964

The counties in which eradication work was done during 1935 were Surry, Alleghany, Ashe, Wilkes, Watauga, Caldwell, Alex-



ERADICATING A WILD GOOSEBERRY BUSH.

Photo by M. L. Nesbitt, U.S.D.A.

ander, Avery, Mitchell, Burke, McDowell, Madison, Buncombe, Transylvania and Macon. The initial eradication work in Jackson and Henderson counties was completed in 1934.

CHECKING ERADICATION OF PREVIOUS YEARS

The necessity for revisiting areas from which wild Ribes have been removed during a previous season, or for calling at home sites from which cultivated Ribes have been dug in the past is



SEARCHING FOR SPROUTS OF RIBES. BUSHES WERE ERADICATED AT THIS PLACE EARLIER IN THE SEASON AND ARE SEEN HANGING WITHOUT FOLIAGE ABOVE ON A NEARBY TREE. AVERY COUNTY.

Photo by H. B. Teague, U.S.D.A.

obvious for the following reasons. Wild bushes are often dug under the hazards of precipitous slopes and cliffs, poison ivy and

poison oak infection, and bites of venomous snakes. They are nearly always dug under weedy conditions. At times (depending upon the season) the fruit has dropped and seedlings may develop by another season. Relief labor is not always thorough but it is consistently good. These factors preclude complete eradication at the initial working, and checking is necessary at least once, and rechecking is advisable two or three times at intervals



A HEDGE OF CULTIVATED CURRANTS GROWING WITHIN AN INFECTIVE DISTANCE OF WHITE PINE TREES. HENDERSON COUNTY.

Photo by H. B. Teague, U.S.D.A.

of one year. During the checking work further efforts are made to procure permission to remove any *Ribes* which owners may have refused to permit removed at initial interviews.

The value of checking is illustrated in the following table, which shows the number of bushes removed in the 1935 check following the initial eradication made in 1934. The checking was done by J. R. Adams and Rowland Leiby, Jr., in Asheville, Hendersonville, East Flat Rock and vicinities between May 9 and June 13, 1935:

AREAS CHECKED	Number Places Checked	Bushes Eradicated in 1934	Bushes Eradicated in 1935
Asheville.....	147	4,519	273
Hendersonville vicinity.....	5	147	220
East Flat Rock.....	12	1,151	14
Hendersonville.....	31	2,106	71
East Flat Rock vicinity.....	15	536	29
Totals.....	210	8,459	606

Checking of eradication is even advisable during the same season, and it has been found advisable to have crews of men doing the checking different from those that did the initial eradication. Roots of plants may be left in the ground by relief



WHITE PINE TREES ARE OFTEN TO BE SEEN NATURALLY REPLACING OUR CHESTNUT TREES KILLED BY THE BLIGHT. WATAUGA COUNTY.

Photo by H. B. Teague, U.S.D.A.

laborers inclined to be careless at times in their work. Abandoned house sites are sometimes overlooked which are found later to have abandoned or escaped bushes. The importance of checking and rechecking is shown in the following table, which refers only to Ribes removal on the Biltmore Estate near Asheville. Other similar instances are on record:

Site Number	On Initial Eradication	On First Check	On Second Check	Total Pulled
1.....	615	24	0	639
2.....	1,316	146	56	1,518
3.....	268	25	0	313
4.....	20	0	0	20
5.....	12	0	0	12
6.....	5	0	0	5
7.....	225	0	0	225
Total.....	2,481	195	56	2,732

The above eradication and checking was done by H. A. Whitman, Jr., April 1 to 16, 1935. The necessity for checking eradication is thus demonstrated by the two tables given above. Checking has since been an important part of the Ribes eradication,

especially when species of the bushes are concerned which are known to have root systems that are more inclined to develop sprouts when parts of the roots are inadvertently left in the ground.

TYPES OF RIBES BUSHES REMOVED

Of some interest is the proportion of cultivated, escaped and wild Ribes pulled during the year 1935, and the species of Ribes found. There are thousands of acres of white pine in some counties where wild Ribes do not grow among or within 900 feet of white pine trees. Such acreages are scouted rather rapidly.



WHITE PINE TREES THAT HAVE SEEDING FROM THE OLDER TREES IN THE BACKGROUND. PASTURING CATTLE DO NOT INJURE WHITE PINE SEEDLINGS.

Photo by H. B. Teague, U.S.D.A.

Intensive scouting is done only when wild Ribes are found or their presence suspected. In all instances residents within the acreages to be scouted are interviewed and their consent secured to remove their tame currant and gooseberry bushes if growing within the infective distance of 900 feet of white pine trees.

The proportion of Ribes bushes removed in 1935 was as follows:

Cultivated.....	112 589
Escaped.....	4,385
Wild.....	150,990
Total.....	267,964

Approximately 10 per cent of the owners of cultivated *Ribes* refuse to permit removal of their bushes at the first interview. Subsequent interviews are then made by the supervisors and these have led to the further removal of about another five per cent. As the work continues, its object (that of protecting white pine trees from possible infection by Blister Rust) becomes better known and appreciated. It appears, however, that the quarantine regulations will need to be enforced by legal process in some instances before the close of the work and before complete eradication can be obtained. The favorable coöperation on the part of the public in general, indicates a strong desire to assist in conserving the white pine trees of the State.

SPECIES OF RIBES FOUND IN THE STATE

Seven distinct species of currants and gooseberries are met within the State. For the most part they grow under different ecological conditions, and sometimes at different altitudes. A few are cultivated for their fruit, although such bushes are very seldom cared for by spray application to control insects and diseases that usually affect them. In fact, only one garden planting of currants and gooseberries has been found from which the fruit is harvested and sold for monetary income. The species *aureum* is used as an ornamental plant.

Ribes bushes removed in 1935 belonged proportionately to the following seven species:

Species of <i>Ribes</i>	Wild <i>Ribes</i>	Escaped <i>Ribes</i>	Cultivated <i>Ribes</i>
Rotundifolium.....	26,083	2,580	73,500
Sativum.....	109	1,767	32,757
Cynosbati.....	124,700	0	0
Grossularia.....	0	38	26
Americanum.....	0	0	5,106
Aureum.....	0	0	1,197
Nigrum.....	0	0	3

ERADICATION WORK IN 1936

In 1936 (up to June 30), *Ribes* eradication was conducted in five counties. Some reworking was done, that is, second visits were made in some counties to remove bushes that might have been overlooked during 1934 or 1935, or that might have

sprouted from seed. The following table summarizes this work to June 30, 1936:

COUNTY	Acreage Cleared of Ribes	Number Ribes Pulled		Total
		Initial	Reworking	
Alleghany.....	11,100	1,058	493	1,551
Avery.....	3,169	8,834	0	8,834
Buncombe.....	30,965	30,838	303	31,141
Watauga.....	7,702	29,570	7,228	36,798
Wilkes.....	33,905	4,231	1,505	5,736
Totals.....	86,841	74,531	9,529	84,060

Eradication was continued in these counties and inaugurated in other counties during the remainder of the year 1936.

NOTE: The above work was done under the immediate supervisions of the following agents working in their respective counties:—Messrs. M. L. Nesbitt, Rowland Leiby, Jr., H. A. Whitman, Jr., H. B. Teague, L. R. Etheridge, and M. M. Ferguson.

SUMMARY ACRES WHITE PINE WORKED AND RIBES PULLED DURING 1934, 1935 AND TO JUNE 30, 1936

The total number of Ribes bushes pulled in the State from the beginning of the project in April, 1934, to June 30, 1936, is 452,077. The removal of these bushes has protected a total of 384,350 acres of white pine in 17 counties. By an acre of white pine is meant that five per cent of the trees in a forest stand are sizable white pine trees. The percentage of white pine will vary, of course, from five per cent to the 100 per cent of pure white pine stands that are native or have been planted.

VALUE OF WHITE PINE IN NORTH CAROLINA

Some effort was made in May and June of 1936 by the supervisors in seven counties to tabulate the number of board feet of white pine that will be cut in 1936 by the lumber mills, and the average price that would be secured for it. A total of 21 mill operators were interviewed in Alleghany, Avery, Caldwell, Watauga, Wilkes, Buncombe and Catawba counties. No interviews were made in ten other counties that grow white pine. The tabulations indicate that 12,086,300 board feet will be cut in 1936 in seven counties, and that the sale price will be from \$16.00 to \$30.00 per thousand.

It is an observed fact that white pine bids well to supplant the chestnut tree in western North Carolina. It is a many purpose wood. It grows rapidly and reseeds readily. It would appear that this tree should be protected from the Blister Rust by a continua-

tion of this project until all wild and cultivated currant and gooseberry bushes have been removed within white pine stands, and within the possible infective radial distance of 900 feet of such stands.

INSECT SURVEY

In our course of regular duties, workers in this Division collect all kinds of insects when and as conditions warrant. These are mounted, labeled and classified, and records of their occurrence are entered on cards. The object of this work is to secure information on the distribution of the insect life of the State. The records have frequent scientific value to entomologists in this and other states.

During the past biennium the list of "true" insects has been increased from 8,792 to 9,170. If the species of animals closely related to the insects are included, the number on record on June 30, 1936, is 9,611.

The insect collection of the Division is kept in suitable boxes. It is one of the outstanding State collections of insects.

The numerous records of captures and the distribution of insects in the State have been prepared in manuscript form for publication. They include records made over a period of 34 years. It is hoped that the data accumulated may soon be issued as a bulletin of the Department of Agriculture.

One technical publication has been issued recently in connection with the insect survey—"The Psammacharidae or Spider Wasps of North Carolina," by C. S. Brimley in the *Journal Elisha Mitchell Scientific Society*, July, 1936, pp. 107-131.

PUBLIC INSECT EXHIBITS AND TALKS

An exhibit of insects in 16 glass covered cases has been displayed by the Division upon numerous occasions during the biennium. The displays have been made at test farm picnics, before biology classes in schools and colleges, at the State Fair and similar public gatherings. It is felt that the public gains not a little knowledge of the habits and control of insects at these exhibits.

Approximately 40 more or less formal talks on insects, other animals, gardening or on other work of the Division have been given during the past two years mainly by Mr. C. S. Brimley and the writer. These have been made before gatherings of farmers, school children, garden clubs and over three radio broadcasting stations in the State. Copies of these talks have appeared upon occasion in the *Agricultural Review* and in the daily press.

MISCELLANEOUS DUTIES

Attention is given when necessary to brief and periodic outbreaks of insects and means of suppressing them. This is done by a survey of the damage caused and advising by correspondence or by press articles how they may be combatted. In this connection reference is made to the importation of several colonies of *Vedalia* lady beetles from Florida, and their liberation after increasing their numbers in the laboratory, in Wilmington, for the purpose of eliminating an outbreak of the Cottony Cushion Scale. Releases of colonies of the beetles were made in August, 1935, and in April, 1936. Similar releases of these predaceous beetles were made in 1926, 1927 and 1928 to control successfully an outbreak of the Cottony Scale in Wilmington.

A limited survey to ascertain the distribution of the potato tuber moth (*Phthorimaea operculella*) was an unexpected duty of the Division during May and June of 1935, when the State of Michigan issued a quarantine against North Carolina Irish potatoes because of the danger of importing the tuber moth into that state from North Carolina on early crop Irish potatoes. Certification as to freedom of potatoes from the tuber moth was a prerequisite to their entry into that State.

A survey of the potato-growing section showed very little or no damage to our potatoes by the tuber moth. The insect was not found in many fields, and potatoes from those fields were permitted entry into Michigan. The tuber moth has never been a destructive pest of potatoes in the State. The quarantine against North Carolina potatoes was removed in the spring of 1936.

More than passing attention has been given during the past biennium to the following insects, most of which have been seasonably destructive—termites in buildings, the household pests of ants, fleas, roaches, clothes moths and silver fish, the Mexican bean beetle, bagworms on evergreen shrubs, weevils in stored grains, the popular but non-destructive 17-year Cicada, and similar insects.

The Division workers attend to the usual amount of correspondence, the issuing of certificates and shipping tags for the movement of nursery stock and bulbs, and the preparation of reports. The writer gives much time to the direction of the two WPA coöperative projects (reported upon in brief above) on

Blister Rust control and Phony Peach Disease eradication which are conducted through this Division in this State largely with Federal funds.

ACKNOWLEDGMENTS

In concluding this report, I acknowledge your continued interest in and support of the work of the Division of Entomology. It is a pleasure, too, to refer to the loyal and enthusiastic service of each member of the Division. Grateful acknowledgment is also made for the hearty coöperation this Division receives from State Leaders H. B. Teague and Charles H. Hearn, who are respectively in active charge of the WPA Federal projects of Blister Rust control and Phony Peach disease eradication in North Carolina. Their monthly and annual reports have been referred to frequently and drawn upon copiously in preparing portions of this report.

WAREHOUSE DIVISION

A. B. FAIRLEY

The following is submitted as a report of the State Warehouse System covering the operation of the System for the years 1934-35 and 1935-36:

The growth of the System has continued in the steady manner as it has during the past eight years. Its benefits continue to reach more and more people each year as the number of depositors grows larger.

The number of warehouses licensed was 114 with a storage capacity of 625,000 bales. The increase in the number of warehouses licensed during the past eight years was over 100%, while the capacity has increased over 200% there now being licensed space for more cotton than was raised in the State during the year 1935-36. While the Government made only a limited loan during the season 1935-36, which did not attract many borrowers, over two-thirds of the crop passed through the various warehouses, there being around 350,000 bales of cotton stored.

The State System has received recognition from all parts of the country from bankers, shippers and producers. Only recently an official of the American Cotton Coöperative Association stated in a speech that the North Carolina State Warehouse System was one of the best, if not the best State system in existence.

As usual, the warehouses were examined four times yearly by the Federal examiners, and with the exception of the Warrenton Bonded Warehouse at Warrenton, N. C., no serious infractions of the warehouse laws and regulations were found; nor were there any serious irregularities found. The case at Warrenton resulted in the State having to pay out from its guarantee fund the net amount of \$2,041.05. This is the first payment that has ever been paid from this fund.

A few small fires occurred, which were settled to the satisfaction of the depositors; the settlement of these losses being aided materially by this office.

The classing department classed and supervised the classing of a large number of bales of cotton. During the biennium several warehousemen were licensed to class cotton for their warehouses. This work is being supervised by the State licensed classer.

The United States Department of Agriculture held a cotton classing school at Greenville, South Carolina, which was attended

by many of the warehousemen in the State Warehouse System. This should result in a great benefit to the producers as the warehousemen will now be able to give the producers an idea of the grade and staple of their cotton. This school was attended also by the State Warehouse Superintendent, who took an examination, passing same and obtaining a license from the Department of Agriculture at Washington to grade and staple cotton.

Loans for new warehouses or remodeling old ones were made to the following:

Beechwood Corporation.....	Pinetops, N. C.
Roanoke Rapids Bonded Warehouse Co.....	Roanoke Rapids, N. C.
Sampson Cotton Storage Warehouse Co.....	Clinton, N. C.
Lincoln Bonded Warehouse, Inc.....	Lincolnton, N. C.
L. L. Davenport and C. L. Benson.....	Nashville, N. C.
W. W. Holding.....	Wake Forest, N. C.

These loans total \$25,000.

Payments from warehouse companies owing the State have continued very good, and those that were behind in interest are now practically up with the interest and are making payments on the principal. As soon as the warehouses collect from the Commodity Credit Corporation for storage due further reduction of interest and principal should be brought about.

The rental of the warehouses at Norlina and Benson has continued, with a good rental being received.

Below is a statement of interest and principal received; also a statement of the funds of the Warehouse System.

Amount collected in past two years:

Interest.....	\$29,670.43
Principal.....	22,247.00
Total.....	\$51,917.43

	Cash on Hand Principal Fund	Amount Out- standing Loans on Which State Holds First Mortgage	Invested In Bonds	Cash on Hand Supervision
6/30/35.....	\$34,985.41	\$299,835.00	\$328,000.00	\$45,437.52
6/30/36.....	\$15,404.83	\$293,612.00	\$389,000.00	\$20,861.47

Purchase of Bonds.....\$74,957.18

Transfers from supervision to principal:

1935.....\$50,000.00

ANALYTICAL DIVISION

W. G. HAYWOOD

In compliance with provisions of regulatory laws covering the sale of fertilizers, cotton-seed meals, feeds and insecticides, this Division has devoted its time principally to the analyses of samples of these products drawn by official inspectors from all parts of the State.

In addition to samples drawn by inspectors a large number of analyses have been made of fertilizers for consumers, marls, limestones, etc., and of materials which are related to the agricultural development of the State.

During the period covered by this report, 7,718 official samples of fertilizers have been analyzed and out of this number only 251 or 3.25 per cent fell as much as five per cent below the value of the guaranteed plant food and thereby became subject to a penalty. Of these samples 1935 represented fertilizers intended for use on tobacco, and out of these only 58 or 3.00 per cent exceeded the maximum chlorine guaranteed by more than the tolerance of 25 per cent allowed under the law. These were subject to a penalty for carrying an excessive amount of chlorine which is injurious to tobacco.

The fertilizer law enacted in 1933, which provided that chlorine be guaranteed in all tobacco fertilizers became effective January 1, 1934.

During the first six months of the operation of this provision, 5.11 per cent of all samples of tobacco fertilizers analyzed in this laboratory were subject to a penalty on account of the presence of an excessive amount of chlorine.

For the corresponding period of the present year the number of penalties on account of excessive chlorine had been reduced to 0.96 per cent, or to a percentage which was less than one-fifth of that of two years ago.

It is therefore very evident that the manufacturers are now exercising strict control over the raw materials which are intended for use in tobacco fertilizers.

Results of the analyses of fertilizer samples have been mailed to the interested parties and published in the Bulletin of the Department, where they were shown in comparison with their guarantees as branded on the containers in which sold.

In cases where the analysis has shown a deficiency in plant food to such an extent as to come within the penalty class, or there has been a sufficient overage in chlorine as to warrant a

penalty, the results have been reported to the Commissioner of Agriculture, who has assessed the penalty for the benefit of the consumer.

The analyses of feed samples have usually shown quite satisfactory compliance with the law, covering the sale of Commercial Feeds. A few violations have occurred, but in such cases remedial action was promptly taken. As is usually the case, several new products have come into use on a commercial scale as ingredients of mixed feeds.

Due to certain conditions prevailing at this time, some classes of feed stuffs are scarce, and prices are apparently advancing. Consequently the manufacturers are very desirous that the regulations be modified so as to permit the sale, under proper labeling, of certain now prohibited lower grade feed mixtures, which would be intended only as roughage and not as balanced rations or concentrates.

In this connection it may be well to consider the advisability of placing before the next General Assembly for their consideration a few suggested changes in our feed law.

This law, adopted in 1909, is an excellent one. A few minor changes, however, would bring it more up to date and make it more uniform with that of most of the other states.

The usual bulletins showing the results of analyses of the various brands of feeds sold in the State have been brought out early in each of the past two years.

There have been no developments of particular interest in connection with the work on cotton-seed meal and insecticides.

All samples have been handled promptly. There have been no complaints as to the quality of these goods found upon the market and the samples analyzed have compared favorably with their guarantees.

The amount and kind of chemical work performed in the laboratory during the past two years is shown in the following summary:

Official fertilizers	7,718
Fertilizers and fertilizer materials for farmers.....	146
Official feeds	904
Miscellaneous feeds	160
Insecticides	43
Cottonseed meals	566
Limes and marls.....	27
Miscellaneous	204
Total	9,768

BOTANY DIVISION

J. L. BURGESS

The last two years have brought advancement along all lines of work in the Botany Division, with the exception of the distribution of legume cultures. Today, September 9, 1936, the State Board of Agriculture reduced the price of legume cultures from fifty cents an acre to fifteen cents an acre.

The total number of field seeds, vegetable seeds and miscellaneous seeds received in the seed laboratory during the past two years has amounted to 12,515 samples.

Most of these samples are what we call current samples, that is, samples sent to us by farmers and seed dealers desiring to know the quality of the seeds they were going to plant, or sell, or buy. One of the major services of the seed laboratory to the State lies in helping the seed dealers secure high-grade seeds to offer the farmers. Another major service is that of helping the farmer determine before planting the quality of the seeds he is about to put in the ground.

For the last twenty-six years we have been aiding the tobacco farmers in the production of high-grade tobacco of uniform quality and growth by recleaning their tobacco seeds before they were planted in the plant bed. These recleaned seeds contain only the heavy well-filled-out and plump tobacco seeds which contain the most plant food to aid the little plant in getting a hold in the ground and obtaining a vigorous start early in the season. These uniform heavy tobacco seeds produce a good stand in the plant bed. The plants having uniform growth are stocky and withstand, in the field, drought and poor cultural conditions much better than other plants grown from light seeds and getting a slow start in the plant bed.

Most of the tobacco counties have demonstration agents who have now put tobacco seed cleaners in their offices, where farmers can have their seeds cleaned near home. The Department, however, is still doing a large amount of recleaning for farmers in counties surrounding Raleigh. During the last two years we have recleaned over 1,666 pounds of tobacco seeds in this laboratory, and, in many cases, samples have been germinated and treated.

The Department of Agriculture uses a revenue seed tag to help defray the expenses of running the laboratory. These tags are distributed at one cent a piece. During the last two years we have distributed 335,284 tags.

Prior to 1910-15, the farmers in the State found it difficult, indeed, almost impossible, to grow clovers and other legumes

in the Piedmont section, with the lone exception of lespedeza, which, at that time, had not come into public notice in this State. It was found that the soil needed both lime to feed legume bacteria, and bacteria themselves to work on clover roots and the roots of other legumes, and thus feed these legumes with nitrogen taken out of the air.

The Botany Division of the Department of Agriculture was directed to offer legume cultures to the farmers at cost of production, and also assist the farmers in getting lime for their soils. This was done to aid them in growing clovers and other legumes so necessary to soil-building processes everywhere. For a number of years, legume cultures were in great demand. During the depression, however, when farmers did not have money for the necessities of life, the purchases of legume cultures fell off temporarily, but are now beginning to pick up with the return of prosperity. During the last two years we have distributed only 409 acres of pure cultures for legume crops.

A few years ago the millers of North Carolina were at the mercy of grain shippers and dealers because the Department of Agriculture was not equipped to check the Federal grades of wheat and other grains. This glaring need on the part of the state millers caused the Botany Division to be directed to arrange for checking the grades of wheat and other grains coming into the State or shipments arising in this State. Since the millers of North Carolina can now have their Federal grades checked when they come into the State from other states or have them placed on grains arising in this State, the Botany Division of the Department of Agriculture is called on many times during the year to assist in settling disputes arising over the grades of grain purchased by the millers of North Carolina. During the last two years, forty-six of these disputed grades came to the Botany Division for adjustment.

We have ninety-six seed dealers doing business in North Carolina under authority of license. Complaints come to the Department from time to time that many deal in seeds without license, and, whenever possible, we correct this infringement of the seed law.

The Division is called on, from time to time during the summer months, to identify plants thought to be poisonous, following the death of cattle or other animals that are thought to have eaten the plants. In most cases the plants sent in are poisonous, and remedies for controlling and eradicating such plants are suggested to the persons sustaining loss of their animals.

DIVISION OF MARKETS

R. B. ETHERIDGE

I herewith submit Biennial Report of the Division of Markets for 1935 and 1936:

The Division of Markets is primarily a service division and is charged with the responsibility of promoting and setting up farmers' organizations. Members of the Division work very closely with and advise the managements with respect to efficient and economical operation. We supervise and direct the certification as to grade of all farm commodities; issue daily bulletins during the marketing seasons, giving pertinent information of our major fruits and vegetables and tobacco, and keep on file market information covering all other commodities which is made use of by the growers. Members of the Division teach the growers how to prepare their products for market and advise, confer with and assist them in the marketing of any and all farm commodities.

In my report covering the biennium 1934-35, I reviewed briefly the economic improvement of the growers of staple crops during that period and wish to record here that the financial status of that group has shown further improvement. The fruit and vegetable growers experienced disastrously low prices for their products all during the depression period and even through the last biennium but have, as a whole, secured much better prices during the past two years and they are now in a much better financial position. The poultry industry has had two exceptionally good years and is in a very favorable position and the outlook is an optimistic one. The industry is expanding along a conservative yet healthy line. Most classes of livestock have shown a phenomenal improvement during the past two years. Dairy cattle have advanced approximately 30% and certain dairy products 50% during this period. The producers of beef cattle have experienced a material advance in the prices of their product and are in better financial condition than at any time during the last seven or eight years. The price of hogs has advanced greatly.

ORGANIZATIONS

The interest in coöperative and mutual organizations continued. The membership of the newly incorporated associations are manifesting a deeper interest in the affairs of their organizations than heretofore and it is believed they will be successful in their various undertakings. There is a growing conviction on

the part of the stockholders that each and every member must contribute something in order to have a good sound business organization and this is a wholesome sign.

Mutual organizations and coöperative associations incorporated during this period are as follows:

Mountain Valley Mutual Canning Association.....	Murphy, N. C.
New Salem Mutual Exchange.....	Marshville, R. 2
Nash County Mutual Exchange.....	Nashville
Hanover Mutual Exchange.....	Wilmington
Edgecombe Farmers Coöperative Exchange Service.....	Tarboro
Rowan Farmers Coöperative Exchange Service.....	Salisbury
Mecklenburg Farmers Coöperative Exchange Service.....	Charlotte
Pitt Farmers Coöperative Exchange Service.....	Greenville
Guilford Farmers Coöperative Exchange Service.....	Greensboro
Alamance Farmers Coöperative Exchange Service.....	Burlington
Robeson Farmers Coöperative Exchange Service.....	Lumberton
Catawba Farmers Coöperative Exchange Service.....	Hickory
Lenoir Farmers Coöperative Exchange Service.....	Kinston
Holly Springs Coöperative Exchange.....	Harris
Mountain Egg Producers Coöperative Association.....	Fairview
Patrons Coöperative Feed Store.....	Taylorsville
Gates Farmers Coöperative.....	Gatesville
Farmers Coöperative Council of North Carolina.....	Raleigh
Martin Farmers Coöperative Exchange Service.....	Williamston
Beaufort Farmers Coöperative Exchange Service.....	Washington
Iredell Farmers Coöperative Exchange Service.....	Statesville
Sampson Farmers Coöperative Exchange Service.....	Clinton
Johnston Farmers Coöperative Exchange.....	Smithfield
Mutual Cantaloupe Growers Exchange.....	Norlina
Farmers Coöperative Gin Company.....	Cherryville
Sandhill Dairyman's Mutual Association.....	Southern Pines
Federated Coöperative Exchange.....	New Bern
Wake Farmers Coöperative Association.....	Raleigh
Albemarle Farmers Coöperative Exchange.....	Elizabeth City
Lee Farmers Coöperative.....	Sanford
East Carolina Farmers Coöperative Association.....	Goldsboro
Randolph Farmers Coöperative.....	Asheboro

With many of the associations or exchanges referred to members of the Division not only wrote the articles of incorporation and by-laws, but assisted them in getting their charters and other matters pertaining to a corporate set-up. One member of the Division worked with a number of the organizations during the earlier period of their operations and I wish to add that the management seemed to appreciate very much the assistance given.

Virtually all farmers' organizations look to this Division for information pertaining to their corporate set-up, by-laws, marketing agreements and other matters for guidance. Assistance given is of such varied nature that it would be difficult to discuss even in a general way. I wish to add, however, that during this period we have concentrated on strengthening the present existing organizations with an idea of getting them on a good, sound

financial basis rather than encouraging the incorporation of additional organizations. The law under which the mutual exchanges and coöperative associations are incorporated requires that they send in annual reports to this Division. Considerable time has been spent with these organizations in helping them with their annual reports.

FRUITS AND VEGETABLES

Shipping Point Inspection Service:

Commodity	Approximate Number of Packages
Irish potatoes.....	2,292,117
Strawberries.....	827,943
Peaches.....	534,670
Snap Beans.....	497,980
Cucumbers.....	135,320
Fresh peas.....	126,968
Green corn.....	85,691
Sweet potatoes.....	68,498
Cantaloupes.....	27,726
Apples.....	21,181
Dewberries.....	6,121
Huckleberries.....	4,557
Lima Beans.....	2,195
Cabbage.....	1,800
Peppers.....	737
Tomatoes.....	1,160
Watermelons (by boat, truck and rail equivalent to)	2,402 cars

The foregoing represent inspection and certification as to grade and required a personnel of 107 licensed inspectors during the heavy movement of potatoes in June, 1935. To give you an idea of the magnitude of this work, I wish to advise that the number of licensed inspectors required to do the work by weeks was as follows:

Week ending April 6.....	1	Week ending June 22.....	81
Week ending April 13.....	3	Week ending June 29.....	49
Week ending April 20.....	21	Week ending July 6.....	20
Week ending April 27.....	43	Week ending July 13.....	17
Week ending May 4.....	45	Week ending July 20.....	42
Week ending May 11.....	48	Week ending July 27.....	62
Week ending May 18.....	38	Week ending August 3.....	58
Week ending May 25.....	23	Week ending August 10.....	55
Week ending June 1.....	54	Week ending August 17.....	17
Week ending June 8.....	102	Week ending August 24.....	4
Week ending June 15.....	107	Week ending August 31.....	2
		Week ending September 7.....	1

This does not include typists, clerical assistance and helpers.

A majority of the men employed during April and May were transferred to other states after the work on strawberries was completed and many of them did not return for other work during the entire season. The greater number of men employed

during June constituted a different group of inspectors and many of these men were transferred to other states when no longer needed in North Carolina. The men who inspected watermelons during July and August, with the exception of five or six, constituted an entirely different group from that used during any other marketing period. It can readily be seen that three different groups of men were used and that each group is qualified by training and experience to inspect certain specific commodities. It is estimated that 150 licensed inspectors were used during the 1935 season.

Just before our potato crop started moving in 1935, we were advised that the State of Michigan had put a quarantine against North Carolina potatoes, and in order to ship potatoes into that State it would be necessary to have the field inspected along with the potatoes at the time they were loaded. We were required to tack a copy of the certificate in the car at the time it was loaded to show that inspection in the field had been made and that potatoes were apparently free from tuber moth. We encountered quite a bit of difficulty in finding experienced personnel with tuber moth experience to set up the necessary machinery before the movement got under way to furnish this additional service to the growers. During 1934 we shipped into the State of Michigan 744 cars, and it was necessary that we comply with the requirements of the State of Michigan in order to move our potatoes into that State during the 1935 and 1936 seasons.

Watermelons shipped during the 1935 season were marketed according to rules and regulations promulgated by the Control Committee of the Watermelon Marketing Agreement. The Control Committee, composed of growers and shippers from the States of Florida, Georgia, South Carolina and North Carolina, represented approximately 85% of the tonnage shipped from those States. The marketing agreement gave the Control Committee authority to prohibit the shipment of watermelons of a grade below that grade specified and to prohibit the shipment of any grade for forty-eight consecutive hours not less than five days apart, which simply meant that members of the industry regulated their shipments according to the demand and their operations were highly successful. The Control Committee required that all melons shipped be inspected and certified as to grade by the Federal-State Inspection Service. The marketing agreement for the 1936 season differed from that of 1935 in that recommendations were made by the Control Committee to the Secretary of Agriculture, who, in turn, issued orders with respect to the grade and quality to be shipped and the prohibition of shipments during a marketing holiday.

Temporary offices for strawberries were maintained at Mount Olive, Rose Hill, Wallace, Warsaw, Burgaw, Chadbourn and Tabor City; for white potatoes at Elizabeth City, Mount Olive, Bayboro, Aurora, Beaufort, Bethel, Pantego, Washington, New Bern, Columbia, Creswell and Goldsboro; for watermelons, at Laurinburg, Edenton, Currituck, Morehead City, Hamlet, Clayton, Maxton, Raeford, St. Paul, Rowland and Faison; for peaches, at Sanford, Gibson, Pinehurst, Candor, Ellerbe and Hamlet; for miscellaneous fruits and vegetables, at Elizabeth City, Columbia, Laurinburg, Ridgeway, Currituck, Norlina, Wallace, Teachey, Goldsboro, Beaufort and Edenton.

TERMINAL MARKET INSPECTIONS

White Potatoes.....	14 cars
Onions.....	3 cars
Tomatoes.....	2 cars
Apples.....	2 cars
Grapes.....	1 car
Oranges.....	1 car
Peaches.....	1 car
Rutabagas.....	1 car
Lettuce.....	1 car
Total.....	26 cars

Inspection and certification as to grade of fruits and vegetables previously referred to are made on commodities grown in the State and shipped to other States are classed as Shipping Point Inspection. Inspections made on commodities grown in other States and shipped into this State are referred to as Terminal Inspections. In Terminal Inspections members of the Division act in a neutral capacity in describing the condition of the commodity upon arrival, and adjustments in the price originally agreed upon are made by the shipper and the receiver. Inspections of this kind are requested only when the product is of a quality and condition considerably below that of the recognized standard.

Market News Service: In coöperation with the Bureau of Agricultural Economics, we issued daily bulletins on white potatoes from Washington, on strawberries from Chadbourn and on peaches and watermelons from Hamlet, during the marketing season. Market reports covering watermelons were issued for the first time in North Carolina in 1935. These bulletins give the growers and shippers pertinent information such as f. o. b. prices at the larger shipping points, number of cars shipped each day and the number of cars each of the terminal market receives, along with the price each market is paying. This information helps in better distribution and marketing.

Stabilization of the Irish Potato Industry: Prior to 1935 this project was carried on coöperatively by the State Department of Agriculture, in coöperation with the North Carolina Agricultural Extension Service, the Extension Services of other States who produce early potatoes, and the U. S. Department of Agriculture.

In 1935, Mr. A. E. Mercker, who was in charge of this work on the coöperative basis, was transferred by the U. S. Department of Agriculture to the Agricultural Adjustment Administration, and was put in charge of Potato Programs, Marketing Section. At the request of the growers and shippers and representatives of the different agricultural institutions in the State, Mr. Mercker was assigned to North Carolina during our marketing period. He works very closely with growers and shippers during the marketing period and strives at all times to keep a uniform price at all shipping points. Through his influence the market is well stabilized and advances in the market well taken care of when conditions justify it.

FARM CROPS

Tobacco: The grading work on this commodity was continued at Farmville and Oxford. The number of pounds graded during the 1934-35 season amounted to 3,677,780 pounds and to 2,438,423 pounds during the 1935-36 season. Congress at this past session appropriated a sum of money great enough to give free grading to growers on a number of markets in each of the tobacco-producing states. The Secretary of Agriculture was authorized to make available free grading to growers at markets where a referendum was held and when as many as two-thirds of the growers who sold on that market voted affirmatively. The grading of all tobacco without any charge is being done on the markets of Goldsboro and Farmville and will be instituted at Oxford when that market opens.

There is no doubt but that the voluntary grading services which this Department has carried on in connection with the Bureau of Agricultural Economics during the last five or six years laid the ground work for the free grading services which the Federal Government plans to make available to tobacco farmers.

Tobacco Market News Service: In coöperation with the Bureau of Agricultural Economics, we issued daily bulletins giving the prices paid to growers for the various grades of tobacco sold on markets where we had the grading work. This report, in addition to the daily prices paid, also contained weekly and seasonal averages, along with the prices paid for the same grade of tobacco the previous season.

Soybeans: Inspection work on this commodity was continued at Washington and Elizabeth City and we certified as to grade 45,107 bushels of soybeans.

Miscellaneous: Assistance was given in the standardization and marketing of farm crops whenever possible.

Poultry and Eggs: One member of this Division spent a considerable amount of time in 1935 in assisting farmers in Eastern North Carolina in getting better egg prices by coöperating and working with mutual exchanges in arranging egg routes. By doing so, the exchanges removed from one to three carloads of eggs weekly during the flush season in the spring, thereby leaving the local markets in much better condition, and egg prices did not drop during the height of the season in the heavy producing sections to as low a level as was anticipated. We have held conferences with mutual exchanges, coöperative organizations and individual producers regarding marketing eggs and standard grades, types of containers to use and machinery in the marketing. An egg marketing exhibit and candling demonstration was put on at the Farmers' Federation Field Day at the Swannanoa Test Farm in September, 1935. Assistance was rendered from this office in connection with the compliance of the Breeders' and Hatchery Codes in particular with correcting misleading advertisements.

In 1936 one member of this Division assisted with the egg marketing program in connection with district short courses held in Asheville, Burlington, Statesville, Monroe and Goldsboro, at which time quality egg marketing was stressed. He also assisted in arranging a poultry and egg route through Lillington, Benson, Smithfield and Selma.

Wool: One representative of the Division visited the principal wool-producing counties and conferred with county agricultural agents regarding wool pools in 1935. No pools were held this year, due to the fact that there was very little interest on the part of the different agencies and the growers, and also due to the fact that the market crashed just at the time arrangements were being made for holding pools.

State Fair: The Poultry Department of the 1935 North Carolina State Fair was managed by a member of the Division. Seventy-four breeders entered birds in the show and approximately 1,100 birds were displayed. Seventy-eight breeds and varieties were shown and \$1,071.00 in premium money was awarded. Assistance was given during and since the Fair in locating and disposing of breeding stock. The premium list and other work incident thereto for the 1936 State Fair have been completed.

DIVISION OF TEST FARMS

F. E. MILLER

This report for the past biennium will present the program of work on each of the six Test Farms with brief statements of the progress being made on the various projects under way.

COÖPERATION

The experimental work is handled in coöperation with the North Carolina Agricultural Experimental Station at the North Carolina State College of the University of North Carolina, and with the United States Department of Agriculture at Washington. Coöperative investigations receiving Federal support are covered by formal memorandums of understanding which are signed by the administrative officers of the agencies contributing to the projects. This coöperative arrangement has been very satisfactory, as it allows for an enlarged program of investigational work. The coöperators have also assisted in planning, financing and carrying forward the experiments.

GENERAL

The Test Farms, as with agricultural conditions in general, have made strides forward in recovery from the low ebb as presented in the last Biennial Report. Appropriations have been increased some to allow for new work to help meet the ever increasing demands for information on farm production problems, and to take care of needed repairs and new equipment. A special appropriation of \$24,352 was made available in January of 1936 for new buildings, additional land, equipment and repairs. This improvement program has been completed, and is reported more in detail under the following report for each Station. The Station farms are now in better shape, as far as buildings and equipment are concerned, than at any other time during the past decade.

The Annual Farmers' Field Days were not held in 1935 in order to coöperate with the State Health Department in the control of the infantile paralysis epidemic. The only exception being the Coastal Plain Station Field Day, which was held in September after the epidemic had subsided. However in 1936 the Field Days were held at all six Stations with a total attendance of approximately 22,000 people. These meetings have proven to be popular events, and are a means of giving the public the benefit of the work on the Station farms.

MOUNTAIN STATION—SWANNANOA, N. C.

S. C. CLAPP

Station Established in 1908

Area of Station, 316 Acres Soil Types, Toxaway and Ashe Clay Loam
Elevation, 2,250 feet above sea level

Climatological data for 1935

Mean Annual Temperature, 55.5 degrees Fahrenheit
Annual Rainfall, 47.91 inches Total Snowfall, 7.7 inches

The mountain section of the State embraces the large plateau area extending eastward from the Tennessee line and including eighteen counties. This region is suited to a diversified agricultural program and the following projects are carried on at the Mountain Station with a view of meeting the increased demands for information on better methods of farming.

POULTRY

Coöperating With N. C. Agricultural Experiment Station

The Influence of Protein Levels on the Growth of Pullets During the Developing Period: The study as noted was completed for publication October 1st, 1935. Single Comb White Leghorn pullets and Single Comb Rhode Island Red pullets in groups of 35 each were started at approximately two pounds weight and carried through the developing period until 25 per cent production was reached and maintained for seven consecutive days, on mashes containing 17.38 per cent, 15.09 per cent and 13.43 per cent protein approximately. Scratch feed was fed in addition to the mash and the birds allowed free range.

The following results attended these investigations:

1. The studies presented no definite difference in the development of body weight, time required to reach sexual maturity, or pullet year production on the groups fed mashes of different protein level.

2. In general the results of these experiments would indicate that the results obtained do not warrant the higher protein level of approximately 17.5 per cent in developing mashes, and that this level during the developing period may be reduced to at least that of the second level under test, or approximately 15 per cent, with the possibility of further reduction without creating a hazard to the future performance of the birds.

To Study the Factors Entering Into the Successful Production, Fattening and Marketing of Summer Broilers: The experiment completing its second year involved a study of the

factors involved in production of summer broilers. Five hatches numbering 1,637 chicks were started on test, the first group being hatched April 19th, and the last group June 14th. Ten days in the starter battery showed ranges in gain ounces per chick from 0.82 to 1.31. Mash consumption per chick in this period ranged from 2.7 ounces to 3.3 ounces. There was noted a relative decrease in gain of weight in chicks in the starter battery as the season advanced. The groups of birds were placed on range from the time out of the starter battery until approximately 1.8 pounds in weight was reached, at which time they were placed in fattening batteries. A direct decrease in gain per bird per day on range was noted in the respective hatches as the season advanced, this finding paralleling that of the previous year.

Calculated days on range required for each hatch to obtain the same weight ran from 59 in the first hatch to 74 in the fifth.

As in the first year of the experiment, an inverse amount of grain and of mash consumed on range existed between the first and fifth hatches, the first group consuming 3.1 pounds of grain and 2.4 pounds of mash per bird and the fifth group 1.7 pounds of grain and 2.7 pounds of mash.

These fattening rations were used, two being home mixed, and one a commercial fattening mash. These rations were fed moistened with water in one group, and with milk in a second group. Fattening was carried out until a definite break in increase in weight was noted. In all cases the ration with a milk supplement gave the greatest gains at a slightly higher feed cost. The commercial fattening ration, which was of a complex nature, gave the highest rate of gain of the mixtures under test. The milk-fed broilers brought a premium of two cents per pound.

Cost of Production Studies: With S. C. White Leghorns and S. C. Rhode Island Reds the feed cost per dozen eggs for a twelve months period was \$0.129.

AGRONOMY

Coöperating With N. C. Agricultural Experiment Station

Fertilizer Requirements for Corn, Wheat and Soybeans When Grown in a Three-Year Rotation on Toxaway Loam Soil: From this study it has been shown that larger and more economical yields of soybean hay have been produced from a complete fertilizer containing higher percentages of phosphoric acid than from those with a normal percentage of phosphoric acid in the mixture. This year's yields further substantiate the previous findings.

Fertilizer and Lime Requirements for Irish Potatoes, Wheat and Soybeans When Grown in Rotation on a Toxaway Loam Type of Soil: The yields of the crops grown during the twenty-year period that this experiment has been in progress have shown that a complete fertilizer has produced the most economical yields of each of the three crops in the rotation. For wheat and soybeans a complete fertilizer with an application of one ton of limestone once in the rotation produced the best yields, however for the potatoes the use of limestone made the conditions favorable for the development of abundance of scab on the potato tubers, which resulted in a low yield of very inferior potatoes. With the wheat crop of 1934, this experiment was completed and discontinued.

Rock Phosphate, Superphosphate, Soft Phosphate and Basic Slag Compared as Sources of Phosphoric Acid on Toxaway Loam Soil When Corn, Wheat and Soybeans Are Grown in Rotation: This experiment is composed of three series of plats, the first series with lime once in the rotation, the second series without lime, and the third series with the nitrogen derived from stable manure.

The yield data shows that the limed series has produced larger yields than the series that did not receive lime, and that superphosphate is the most efficient source of phosphoric acid used in these trials.

Rock Phosphate and Superphosphate Compared as Sources of Phosphoric Acid for Corn, Oats, Wheat and Soybeans on Toxaway Loam: The records from this experiment add to the findings of previous years that superphosphate is a superior carrier of phosphoric acid when measured in terms of crop yields produced in this crop rotation.

Comparison of Rock Phosphate and Superphosphate for Corn When Crimson Clover Is Grown in the Inter-cover Crops in a Cropping System of Continuous Corn on Toxaway Loam: Results have shown that superphosphate has produced larger yields of corn per acre than has the same amount of phosphoric acid derived from finely ground phosphate rock.

Another finding in connection with this experiment is that the yield of corn per acre has been maintained and even increased on this soil by continuous cropping, if a winter cover crop of crimson clover is grown each year and turned under in advance of planting the corn.

A Study of Different Fertilizer Treatments and Methods of Utilizing the Legume Crops After Grown in a Three-Year Rota-

tion of Corn, Soybeans, Wheat and Lespedeza on Porter's Loam Soil: Since this experiment has only been in progress two years, no indications are given at this time as to what may be expected.

Wheat Variety Studies: Of the eight varieties of wheat tested, the Fulcaster continues to give the largest yield. The average yield over a 10-year period is 27.1 bushels per acre.

Date of Seeding Wheat: In this test, plantings are made every fifteen days, beginning September 15th and ending November 15th. The results show that the planting on October 1st gives the largest yields. Discontinued.

Corn Variety Test: The records so far indicate that Holcombe's Prolific, Southern Beauty, Bigg's Prolific and Jarvis' Golden Dent are best suited to this section.

Oat Varieties: The Fulghum variety continues to give the largest yield. The spring plantings have given better results than fall plantings, owing to the effect of winter killing.

Rye: In comparing the value of Common and Rosen rye for this region, the tests continue to show a small increase in yield in favor of the Rosen.

Flax: One acre of flax was planted in the spring of 1934 and 1935. This project was handled in coöperation with the U. S. Department of Agriculture and the Textile Foundation Institute. The acre produced 2,416 pounds of excellent quality flax which was shipped to Clemson College, S. C., for further fibre studies. Discontinued.

Lespedeza Varieties: Four varieties of lespedeza have been planted in the main apple orchard for soil building and to study adaptation of varieties. The Korean seems best suited for this section.

Continuous Corn and Crimson Clover: This has been the outstanding soil building test in the Station's program. A ten-acre field has been planted annually to corn and crimson clover for the past twenty-five years. The clover is planted in the corn at the rate of fifteen pounds per acre at the time of the last cultivation. The clover is plowed under around the first of the following May, and the land planted back in corn. At the beginning of the test the land produced eighteen bushels of corn per acre, and at the close of the twenty-five year period, the production was fifty bushels per acre.

DAIRYING

Coöperating With N. C. Agricultural Experiment Station

Dairy Cattle Pasture Studies III: Dairy cattle pasture studies were started at the Mountain Station in 1930. The object was to determine the kind of plant food, the quantity needed and the proper time of application. Five three-acre plats were used in the study. All plats were cared for in the same way with but one exception. They were fertilized differently. The plats were fertilized as follows:

PLAT NUMBER	I	II	III (check)	IV	V
Superphosphate.....	300	300	0	300	300
Nitrate of Soda.....	160	260	0	0	360
Muriate of Potash.....	50	50	0	50	50
The average yield per plat on the alfalfa equivalent basis.....	I 1.93T	II 1.94T	III 1.21T	IV 1.12T	V 1.74T

Plat III, the check plat, gives us the average yield per acre for the five-year period when no fertilizer is used. To arrive at the net yield per acre due to fertilizer we deduct the net yield of the check plat from the net yield of each of the other plats. This gives us the net yield due to fertilizer as follows:

PLAT NUMBER	I	II	IV	V
Net alfalfa equiv. per A.....	.72 tons	.73 tons	.09 tons	.63 tons
Alfalfa figured @ \$20 per ton.....	\$14.40	\$14.60	\$1.80	\$12.60
Fertilizer cost per A.....	5.92	7.57	3.28	9.22
Profit or loss per A. from fertilization....	8.48	7.03	5.08	3.38

At \$20.00 per ton the check or no fertilizer plat produced \$24.20, and the fertilized plats, with one exception, produced a good return per acre above that figure.

The poor results on plat IV, which received phosphoric acid and potash only, were no doubt due to a heavy infestation of June beetles and ground moles. These pests undermined the root system of the desirable grasses, destroyed them. Crab grass fills in but only gives temporary grazing.

The data shows that ordinary pasture gives a good return; that fertilization on a good sod will increase the return, and that it is profitable to give our pastures continuous attention the same as the cultivated crops.

Herd Development: The management of the dairy herd follows the plans advised for the better commercial dairies of the State. The herd is enrolled in the Herd Test of the American Jersey Cattle Club, and all animals are on test continuously.

Many good individual and herd averages have been made. The best record made, however, because it indicates persistency, consistency and longevity, is the life time record of Eminent's Foxy Eva 562990—a production of 123,201 pounds of milk and



JERSEY HEIFERS GRAZING PLAT V, MOUNTAIN STATION.



EMINENT'S FOXY EVA—LIFE TIME RECORD, 123,201 POUNDS OF MILK
AND 5,424 POUNDS OF BUTTERFAT.

5,424.73 pounds of butterfat. This record does not include the present lactation. As far as can be determined, Foxy Eva has the highest life time record of any living cow in the State.

The Mountain Station herd average for last year was 6,976 pounds milk and 362.10 butterfat.

Lespedeza and Alfalfa Hay for Dairy Cattle: This is a study of the comparative value of lespedeza and alfalfa hay, one trial of which was conducted at the Mountain Branch Station. Alfalfa proved to be a little more efficient than lespedeza for milk and butterfat production.

The results of this study are published in Bulletin No. 302 of the North Carolina Experiment Station.

HORTICULTURE

Coöperating With N. C. Agricultural Experiment Station

Fruit Variety Studies: This work has been continued as in the past, and additional information has been secured.

a. *Grapes:* Records on the 72 varieties included in the test continue to show that the following are best suited to this section: Concord, Niagara, Green Mountain, Lutie, Herbert, Ontario and Delaware.

b. *Raspberries:* The Latham has given the best results of the eight varieties used in this test.

c. *Cherries:* The Montmorency and Early Richmond are the superior sour varieties and the Napoleon and Schmidt are the most desirable sweet types.

d. *Apples:* The test includes 38 varieties and the Winesap, Staymen, Rome Beauty and Delicious seem to be the leaders in this section. Several new varieties are also being tested.

e. *Dewberries:* The Lucretia continues to be the leading variety for this section.

f. *Strawberries:* The Premier and Warfield are the best varieties in this section of the State.

A spacing test for strawberries was started in the spring of 1936.

Apple Pruning: The experiment was started in 1919 to determine the effect of the amount of annual pruning on tree performance and yield of fruit. The lightly pruned trees have given the highest total yields. The information available at this time indicates that different varieties may require a varying amount of pruning.

Apple Storage: The results show the importance of a properly constructed apple storage house in order to control temperatures and humidity.

The Vegetable Garden: The practice of maintaining a year-round vegetable garden is being continued. Information is secured on varieties best suited to the section, cultural practices and insect control.

SWINE

The Family Sow: A small herd of Berkshire hogs are kept at this Station, and information is secured on the cost of raising pigs. Breeding stock is also sold to farmers of the section at a reasonable price.

FORESTRY

In 1934 three acres of land were planted in four variety of pines for the purpose of forestry demonstration, and to secure cost data on growing timber.

Timber areas on the Station have been properly thinned as an example of the proper methods in forestry management.

THE 4-H CLUB CAMP

The 4-H Club Camp, located on the Station farm, is proving valuable and popular to the Club members in Western North Carolina. Each week during the summer a different County group of boys and girls attend the Camp for a period of study and recreation. The groups are under the leadership of their County and Home Agents. A study of the experimental work on the Station is a part of the course of study for the different county clubs attending the camp.

PUBLIC RELATIONS

The Station auditorium is proving to be a community center for meetings of farmers and civic organizations. The principal meeting of the year in this building is in connection with the Annual Farmers' Field Day, which is held on the third Thursday in August. The average attendance at these meetings is approximately 2,500 farmers and others interested in agricultural development of the region.

The work of the Station continues to grow in popularity as is evidenced by the increasing number of visitors each year seeking information on various agricultural subjects. It is estimated that we have an average of 500 visitors each month.

IMPROVEMENTS

The following improvements and equipment purchased during the biennium adds much to the efficient handling of the program of work.

- a. I. H. C. tractor F-20
- b. Tractor disc-harrow
- c. Oliver manure spreader
- d. Oliver mower
- e. One-half ton pick-up Chevrolet truck
- f. Painting eight poultry buildings
- g. New poultry brooder house
- h. Two poultry range shelters
- i. Combination garage and stable building for foreman
- j. Screening and painting inside dairy barn
- k. Repairing milk house and adding equipment
- l. Purchase of eleven acres of land adjacent to station.
- m. Connecting 4-H Club Camp with Grovemont sewer line and installing toilets, lavatories and shower fixtures at the camp. Improvements were also made on the grounds and swimming pool. This work was made possible by the help of W.P.A.

COSTAL PLAIN STATION—WILLARD, N. C.

CHAS. T. DEARING

Station Established in 1905

Area of Station, 293 Acres Soil Type, Norfolk Fine Sandy Loam
Elevation, 51 feet above sea level

Climatological Data for 1935

Mean Annual Temperature, 62.9 degrees Fahrenheit
Annual Rainfall, 47.78 inches Total Snowfall, 3 inches

The principal lines of work at the Coastal Plain Station relate to agronomy, horticulture, livestock and poultry.

The last report told of the Red Polled Cattle project and of the Jersey herd at the Station. Unfortunately it was found that the cooperating agencies were unable to continue the Red Polled project. The project was, accordingly, closed out and the cattle belonging to the Government were shipped to the Brooksville Station of the Animal Industry Division, where they were consolidated with other Red Polls. Cattle belonging to the North Carolina Department of Agriculture were sold in the State, as it was deemed impractical to continue a project with only these animals. Since the disposal of the Red Polled cattle the Station has been working to build up the registered Jersey herd to its former size (75 head). Accordingly, we have made practically no sales of animals during the biennium. At the beginning of this period, owing to reduced budgets in connection with the general financial depression, it has become necessary to sell off much



GREENHOUSE, OFFICE BUILDINGS AND SUPERINTENDENT'S DWELLING, COASTAL PLAIN STATION.

of the Jersey herd. In doing this we reserved for the future herd the two best cows—"Fern Lucile" and "Field Flower" and their progeny. The present herd, therefore, consists of these two cows, their daughters, grand-daughters and great-grand-daughters, and the herd is in the best shape it has been in at any time from the standpoint of production. Production in this herd has increased with each of the last three sires. Recently a new sire—Oxfordia's Lad of Morrocroft, was purchased from Hon. Cameron Morrison, and it is hoped that this fine prospect will again bring about an increase in the herd's production. The herd is among the healthiest in the State, according to official tests, and is one of the highest butterfat-producing herds of the State. As an outgrowth from the Red Polled cattle work, the Station has developed a series of temporary pastures and has been using these effectively to supplant the permanent pastures.

DAIRY RESEARCH

Coöperating With N. C. Agricultural Experiment Station

Herd Development (Jerseys): The Station herd was started in 1910, and three sires have been proven at the Station. The following table gives the data on the three sires in the Superior Germ Plasm Survey:

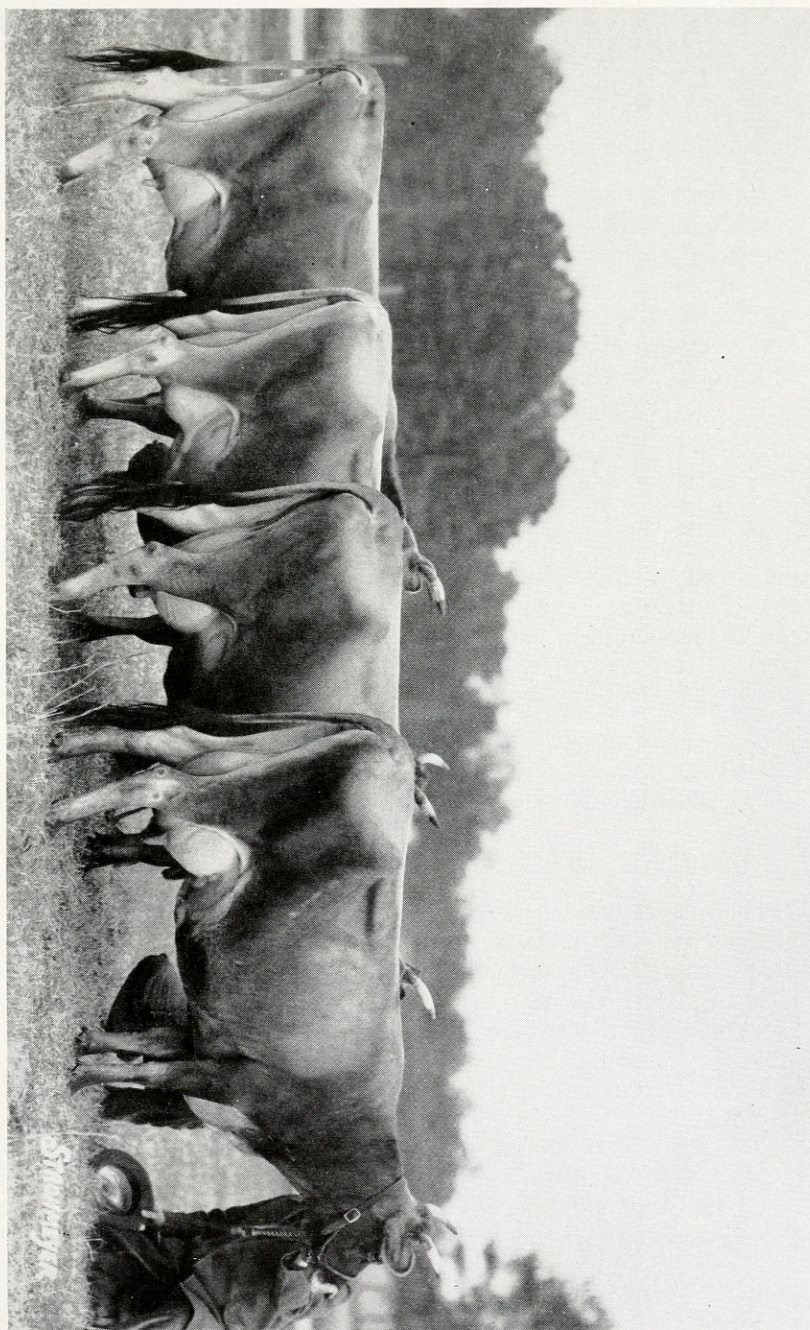
Sire No.	Pairs of Daughters and Dams	RATING OF SIRE			NAME OF SIRE
		Percentage of Butterfat	Production of		
			Milk	Butterfat	
2		F	E	E	Eminent 19th 78620 Rumina's King 160969 The Distinguished Eminent 222775
3		P	G	G	
4		G	P	U	
Number of daughters better than dams		39	45	51	

E—excellent, G—good, F—fair, U—undetermined, P—poor.

The American Jersey Cattle Club in their analysis of Tested Sires and Dams gives the above sires credit as follows:

Eminent 19th 78620 is credited with 28 daughters averaging 549.79 pounds of fat, 10,706 pounds of milk, 5.14% butterfat.

Rumina's King 160969 is credited with 21 daughters averaging 622.95 pounds of fat, 12,343 pounds of milk, 5.05% butterfat.



COASTAL PLAINS STATION. FOUR DAUGHTERS OF THE DISTINGUISHED EMINENT 222775. THEY ARE GRANDDAUGHTERS OF RUMINA'S KING 160969 AND GREAT-GRANDDAUGHTERS OF EMINENT 19TH, 78620.

The Distinguished Eminent 222775 is credited with 17 daughters averaging 604.24 pounds of fat, 11,008 pounds of milk, 5.49% butterfat.

This herd also contains two cows which have usual life-time production plus progeny performance:

Eminent's Fern Lucile 562998 has a life-time record of 101.841 pounds of milk and 4,882.15 pounds of butterfat. She also has three daughters that average 760.31 pounds of butterfat and 13,786 pounds of milk testing 5.52%. Two of them have won gold medals. She also has other daughters on test and some of her sons are at the head of the leading Jersey herds in North Carolina.

Eminent's Field Flower 563000 has a life-time record of 99,816 pounds of milk and 4,908 pounds of butterfat. She has four daughters averaging 569.0 pounds of fat, 10,702 pounds of milk testing 5.32%.

The records of this herd represent inherent capacity to produce and reproduce, a feeding and management plan to support both functions, a disease control plan enabling the progeny of the various bulls to mature in a healthy state, and a plan of continuous testing which in a way is a yardstick measuring all the phases of breeding and management of dairy cattle.

Lespedeza vs. Alfalfa for Dairy Cattle: One feeding trial of this study was conducted at this Station. The results are published in Bulletin 302 of the North Carolina Experiment Station.

SHEEP

The sheep project at the Station has been continued, but this project has not prospered owing to warm, humid climate and to parasites affecting the health of the animals. It is believed that if the Station had more area so that the sheep could be rotated from pasture to pasture at frequent intervals it might be possible to overcome this trouble. Systematic drenching during the summer season has been of great assistance in controlling the trouble.

SWINE

The Station has continued its two sow and boar hog project, it being the policy not to increase the hog work at this Station beyond this point on account of the presence of large dairy and poultry projects. But while the project is held within limits, nevertheless, it is considered an important project because it furnishes a recognized source for the purchase of breeding stock

throughout the territory. It is certain that the steady continuance of this project over a long period and the regular selling of good breeding stock throughout the territory, where it has served as nuclei for the spread of good stock, has been largely responsible for the elimination of the "razor back" in Southeastern North Carolina. Of course other factors have also been effective, such, for example, as the work of the Extension Department in disseminating information on better feeding, breeding, etc.

FORESTRY

The forestry work at the Coastal Plain Station has been continued, but during the period little actual forestry work has been required as the forest was thinned during the last biennium. Shrubbing of undergrowth has been the only work under way.

POULTRY

Coöperating With N. C. Agricultural Experiment Station

A Comparison of the Value of a Combined Starter and Developer Mash With the Present North Carolina System of Separate Starting and Developing Mashers for the Efficient Development of Chicks to the Laying Age and the Relation of Such Systems of Feeding to Subsequent Production: The project was started during the spring of 1934 and has since been in progress. The test birds have had a mash available with an approximate protein level of 17.5 per cent and the control birds a mash with an approximate protein level of 21 per cent for the first ten weeks, and thereafter a development mash of approximately 17.5 per cent protein level. Both groups were liberally fed on scratch feed. Body weights show the test birds 0.4 pound heavier with less grain consumption, but with a higher consumption of mash. Production studies are in progress. Experiment genetically controlled.

The Influence of Protein Levels on the Growth of Pullets During the Developing Period: The study as noted was completed for publication October 1st, 1935. Single Comb White Leghorn pullets and Single Comb Rhode Island Red pullets in groups of 35 each were started at approximately two pounds weight and carried through the development period until 25 per cent production was reached and maintained for seven consecutive days on mashes containing 17.38 per cent, 15.09 per cent and 13.43 per

cent protein approximately. Scratch feed was fed in addition to the mash and the birds allowed free range.

1. The studies presented no definite difference in the development of body weight, time required to reach sexual maturity, or pullet year production on the groups fed mashes of different protein level.

2. In general the results of these experiments would indicate that the results obtained do not warrant the higher protein level of approximately 17.5 per cent in developing mashes, and that this level during the developing period may be reduced to at least that of the second level under test, or approximately 15 per cent, with the possibility of further reduction without creating a hazard to the future performance of the birds.

Cost of Production Studies: With Single Comb Rhode Island Reds the feed cost per dozen eggs for twelve months was \$0.185.

Health of the Flock: The Station has an adult flock of 425 Single Comb Rhode Island Reds. This flock is certified to be free of Bacillary White Diarrhea, and is accredited by the State Veterinarian.

With this disease-free flock the Station is endeavoring to get as many hatching eggs, baby chicks, pullets and cockerels as possible into the hands of farmers and poultry breeders by making these available at a reasonable price.

AGRONOMY

Coöperating With N. C. Agricultural Experiment Station

Fertilizer and Lime Requirements for Crops Grown in a Three-Year Rotation of Corn, Oats-Vetch, Soybeans (turned under) and Soybeans for Seed: The soybean crop grown in this experiment in 1934 was harvested for seed. The yields from the crop add to the findings of previous years that the use of a complete fertilizer for the crops in this rotation is essential. The use of lime once in this rotation has increased the yields of the crops grown. However applications of lime have made conditions more favorable for the development of corn root rot. The disease has only been held in check on those plats which have received heavy applications of potash.

On the limed series of plats, a manganese deficiency chlorosis is prevalent on the soybeans and continues to become more severe and injurious to the crop as the experiment progresses.

Fertilizer and Lime Requirements of Crops Grown in a Three-Year Rotation of Corn, Oats-and-Vetch and Soybeans: The ob-

ject of this experiment is to determine whether the fertilizer requirement of the crops could be supplied by applying the same amount of nutrients that are removed by the crops when harvested. The results secured thus far show that the fertilizer requirements cannot be met in this way. Crops take up far larger amounts of both nitrogen and potash than it is economical to apply.

Applications of lime once in the rotation, in addition to this method of fertilization, have not been profitable and have served to make the manganese chlorosis of soybeans more severe.

FORAGE CROPS

Coöperating With U. S. Department of Agriculture

The forage crop work of the Station was considerably curtailed in the spring of 1936. Several of the projects were discontinued as sufficient information had been secured and others were modified. The N. C. Agricultural Experiment Station was also brought in as a coöperator. The projects started in the spring of 1936 will be represented in the next report. A brief report on the forage crop work through 1935 is as follows:

Lespedeza Sericea: The one acre planted in 1932 has been continued. Results show that usually two cuttings per year of good hay can be made, provided the first cutting is made not later than June 1st.

Crotalaria: Of the varieties tested the *C. incana* and *C. lanceolata* seem to be more promising here. Marked increases in yields have been obtained following the plowing under of a crop of *crotalaria*, but while this crop shows much promise as a green manure crop for poor soils, it cannot be considered as competing with soybeans for this purpose on the better soils of this region.

Soybeans: The variety tests begun in 1932 have been continued, each year weeding out the less desirable. About 300 new introductions from foreign countries have been grown in short rows. These include about 50 edible varieties. Several of the more promising edible types have been grown in increase plots with the view of distributing the seed to interested growers at a moderate cost.

The Forage Crop Nursery: This nursery consists of acid tolerant legumes. The original planting consisted of 135 different species of legumes. The less desirable have been discarded and the others are studied from the standpoint of economic value in the cropping system of this region.

CORN

The variety test with corn was discontinued in the fall of 1934. The outstanding white varieties in these tests have been the Cokes Prolific, of which the Station has developed an improved strain, and the Latham's Double. The yellow varieties are earlier in maturing than the white, but the yields are not so heavy. Golden Dent, Jarvis, Golden and Indian Chief have been the leading yellow varieties in the test.

HORTICULTURE

Coöperating With the U. S. Department of Agriculture and the N. C. Agricultural Experiment Station

The work with small fruits was changed somewhat in the spring of 1936, and several new projects will be under way for the next biennial report. The horticultural work up to January, 1936, will be briefly reported as follows:

Muscadine Grape Investigations: This type of grape has taken on more importance since the repeal of prohibition laws. The Station is serving as a source of information on the culture of Muscadine grapes, and there is a decided movement under way



A CRATE OF YOUNG DEWBERRIES. THIS FRUIT WAS INTRODUCED TO NORTH CAROLINA FARMERS FROM THE COASTAL PLAINS STATION.

to increase the acreage. The Station's vineyard, which comprises 20 acres, is affording a demonstration of cultural practices, pruning and training for interested parties. The vineyard tests also supply information on varieties, costs and returns.

Blueberry Investigations: As stated in the last report this project has not progressed much from an investigational standpoint since the U. S. Department of Agriculture withdrew its resident specialist. The test plantings on the Station have grown well and produced abundant crops. Seedlings of the native high bush blueberry are more promising for commercial purposes.

Bulb Investigations: These tests deal chiefly with variety and storage studies. Over 100 varieties have been tested for adaptation to Southern conditions. It has been clearly demonstrated that Southern-grown bulbs will force earlier than Northern-grown bulbs.

Bulb Disease Control: The study of bulb diseases and the use of various disinfectants in powder and liquid form as agents of control has been carried forward. The results show that by the use of disinfectants that it is possible to clean up badly diseased stocks and bring it back into good cultural conditions. These findings have been helpful to the bulb growers in Southeastern North Carolina in handling their disease problems.

Raspberry Breeding: This project has been continued through the biennium, and additional seedlings have been tested. Several seedlings of the Japanese trailing raspberry are showing much promise. These are crosses on the better American varieties.

Strawberry Investigations: This is one of the major horticultural projects on the Station. The work is handled in close co-operation with the Bureau of Plant Industry of the U. S. Department of Agriculture. Thousands of seedlings of known parentage are tested annually, and the more promising are multiplied for further study. The new varieties developed from these tests and introduced are as follows: Blakemore, Bellmar, Southland Fairfax and Dorsett. The Blakemore has spread generally over the United States, and is generally grown in the Wallace-Willard section of the State. The Blakemore continues to average 50 cents per crate above the Missionary variety on the Wallace cash auction market.

PUBLIC RELATIONS

During the biennium the Station has held two Annual Farmers' Field Days, the first of which had the largest attendance of any Field Day so far at this Station. The crowd at the 1935 Field

Day was somewhat limited on account of rainy weather, but a successful Field Day was held nevertheless, with approximately 3,000 people present. In addition to the Annual Field Days, the Station has held on the day following, each year, Negro Farmers' Field Days with an attendance of approximately 1,000 farmers. In the spring of each year the Station has held a Strawberry Day for the benefit of strawberry growers, and for the purpose of acquainting these growers with extensive strawberry research work of the Station. The strawberry is one of the principal money crops in the section. In addition to these special meetings many other smaller meetings have been held. For example, the vocational agricultural teachers held their district meeting at the Station, and their competitive judging contests. Different county agents have had days at the Station with their constituents, and many other small groups and individual farmers have visited the Station during the year. In fact not a day passes without some visitation of this type and some service being rendered. One of the principal services rendered to farmers has been that of advising and assisting them in the care of sick animals, particularly dairy cows.

IMPROVEMENTS

During the period a tenant house was constructed and a new Chevrolet 1½-ton truck purchased. The principal improvement item was the digging of a deep well for the purpose of developing an adequate water supply. The Station has been handicapped by an inadequate supply until this work was done. An 8-inch well was dug to a depth of 107 feet and produced a flow of good water to the amount of more than 40 gallons per minute over a 24-hour period test. It is believed that the well will yield 60 gallons per minute. This well has been fitted with a windmill and the pumping by wind will be metered with a view of getting information of definite character for the benefit of farmers in the southeastern part of the State. The former deep well has been left intact with its electrical pumping head and will be used to supplement the new well and windmill as needed during periods of calm.

In addition to the above improvements made by the State, the Station has also secured support for improvement work from the FERA and WPA during this period. With the help of the WPA four acres of land were cleared of trees and partially cleared of stumps. This land is intended for use as virgin soil for bulb research. The FERA furnished labor assistance on sev-

eral projects during the first year of the biennium. These projects were as follows:

1. Improving ten acres of permanent pasture by removing stumps, leveling land, plowing and reseeding.
2. Improving four acres of sheep pasture by removing stumps, leveling land, plowing and reseeding.
3. Extending the irrigation system, using pipe on hand, to permit irrigating approximately 25 additional acres of land.
4. Rebuilding terraces to prevent soil erosion on ten acres of land.
5. Completion of the dripless lath shade house which was started by funds secured from the Public Works Administration. The Public Works funds has purchased all material and partially constructed the building. The FERA furnished labor for the completion of the work.

TOBACCO STATION—OXFORD, N. C.

E. G. Moss

Station Established in 1912

Area of Station, 250 Acres Soil Type, Durham Sandy Loam
Elevation, 500 feet above sea level

Climatological Data for 1935

Mean Annual Temperature, 59 degrees Fahrenheit
Annual Rainfall, 43.36 inches Total Snowfall, 11.5 inches

All tobacco research work is in coöperation with the Office of Tobacco Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, and the N. C. Agricultural Experiment Station.

The seasons for 1935 and 1936 have been favorable with the exception of the drought which occurred in May and June, 1936. This drought necessitated a tremendous amount of extra work in watering and transplanting tobacco and delayed the germination of the cotton seed. On June 12th, 1.27 inches of rain fell, and from then on during the balance of the summer there was sufficient moisture to make a very satisfactory crop. The tobacco as a whole has good color but is light in weight, consequently the yield per acre will be less than in 1935.

The research work at the Tobacco Station was enlarged during the spring and summer of 1935 to include some studies of the Granville wilt. In order to do this work, 4.12 acres of land were leased near Creedmore in the southern part of Granville County. Another plot of land containing eight acres was leased beginning January 1st, 1936, in the same area for the purpose of further enlarging this work.

Beginning January, 1936, twenty acres of land were leased, about ten miles south of Raleigh, by the N. C. Department of Agriculture for the coöperative program with root-knot on tobacco. Work on this project has been started this year. The two outhouses on this location are being repaired so they may be used, and a tobacco curing barn has been constructed. The three locations above mentioned are admirably situated, both with reference to the infection of the disease and accessibility. The fields are typical of the area and are well suited for plot work.

The lease on the four-acre plot of ground in Forsyth County on which the black shank work has been carried on has been renewed. This work will continue along lines followed during the past five years. The varieties showing resistance to this disease will be crossed on flue-cured varieties for quality, and a study of host plants will be made beginning this year. The effect of the chemicals in sterilizing the soil will be continued.

Arrangements have been made to continue the studies of Black Root-Rot (*Thielavia*) on infected soils in Guilford County. The diseases mentioned above are spreading each year with increasing damage, but in order to make field tests, it is necessary to use land that is badly infested.

Downy mildew was wide spread during the 1935 and 1936 seasons, but no serious damage done. Work is being continued on this disease.

Fertilizer Tests With Calcium Magnesium Sulphur and Chlorine on New Land: These tests did not show any outstanding differences during 1935. The deficiencies were beginning to show up on a few plots, but bacterial wilt developed in one plot which made it necessary to discontinue the planting of tobacco on this field, and move the work to an adjoining field, which was started during the 1936 season. An additional plot of ground will be cleared so that it can be used later for these plots.

Fractional Applications of Fertilizer: The tests were continued during 1935. The results show that split applications of complete fertilizer are preferable to a second application of nitrates or nitrate of potash. These tests were discontinued in 1936.

General Fertilizer Tests: This consists of 72 plots, which were continued during 1935. Thirty-six of these plots had been limed with ground dolomite, having received a total of three tons per acre over a nine-year period. Wild legumes have come in the limed plots to such an extent that the tobacco is coarse and heavy. The pH on the limed plots varies from 6.7 to 7.4, but on account of the rotation no root diseases have developed in these plots.

Sulphur Tests: Special plots designed for the study of the effect of sulphur on tobacco will be continued. There are indications that large amounts of sulphur trioxide, as it is combined with fertilizer materials, have a tendency to darken the color of the cured leaf. The yield of cured leaf has not been materially affected either way.

Plant Nutrition Investigations: Studies of the effect of different legumes, preceding tobacco are being continued. Soybeans,



PLANT—SPECIAL 400—HIGHLY RESISTANT TO BLACK ROOT-ROT (THIELAVIA)

cowpeas, lespedeza, hay, vetch and crimson clover are grown and turned under. Tobacco is planted on these plots, also on plots on which the native weeds were allowed to grow. When as much as 100 pounds $P_2 O_5$, 100 to 150 pounds K_{20} and 13 pounds N are added from materials free from SO_3 the quality of the tobacco is much better than on plots where SO_3 is present in large quantities.

Tobacco Varieties: A number of selections of the best flue-cured varieties have been made, and these are being studied, both as to yield and quality. These varieties are being crossed and pure strains selected.

Black Shank (Phytophthora nicotianae): The black shank disease of tobacco, caused by *Phytophthora nicotianae* Bredade Haan, has spread from a small area in Forsyth County to six other Piedmont counties since 1930. A program of breeding was started in 1931 to develop a flue-cured selection resistant to the disease. Out of sixty-six flue-cured varieties and selections tested only one (York) showed slight resistance. Two varieties of *Nicotiana tabacum* and three varieties of *Nicotiana rustica* from Russia showed high resistance. Cuban High *Nicotiana* and two Dark-fired selections, developed for resistance to black shank, were resistant.

Cigar wrapper strains resistant to black shank were crossed with a number of flue-cured varieties, and as a result of selection and selfing for three and four generations, two resistant strains were secured, which had visible physical characters of the flue-cured parent.

A hybrid No. 301, which was developed in Florida, is highly resistant to this disease. This selection has been crossed on flue-cured varieties with good results. By continued back crossing on flue-cured tobacco and selection, a good tobacco with resistance will probably be available soon.

Black Root-Rot: The black root-rot disease of tobacco, caused by *thielaviopsis basicola* (Berk) Ferraris, is general in Piedmont North Carolina on soils that have been heavily limed. A program of breeding and selection was started in 1928 to develop a strain of flue-cured tobacco resistant to the disease. As a result of selecting and selfing, three resistant strains have been secured. Strains of Paris Wrapper are fairly resistant, and "Special 400" is highly resistant under North Carolina conditions. Jamaica, which shows some resistance, has not been improved by selection. No 400 has maintained its resistance, and is being planted by a number of growers.

Bacterial Wilt: Bacterial Wilt is slowly spreading from an infection center at Creedmore, N. C. It is already destructive in three counties and threatens to become destructive in other areas of the bright tobacco section of North Carolina, because the casual organism (*Bacterium solanacearum* E. F. S.) is widely distributed on tobacco, tomato, white potato and numerous other host plants. Experiments designed to develop control measures were started in 1935 and consist of four major lines.

1. Breeding for resistance, in which resistant stocks are being isolated in the field from promising varieties found in greenhouse tests and the subsequent combination of resistance with the necessary quality by a program of simple crosses and back crosses together with field and greenhouse selection.

2. Host range studies, in which the susceptibility of common crop plants and weeds is determined. This information serves as a basis for crop rotation experiments. During the past two years it has been demonstrated that the organism (*Bacterium solanacearum*) causing Granville wilt of tobacco causes the same disease in a number of other plants than those heretofore reported. Sixty-one plant species have been tested for susceptibility by growing them in a field highly infectious for tobacco. Of these, 26 have been found to contract the disease, and in the case of nine of the species, the disease was just as severe as it was on adjacent rows of tobacco. These tests included nearly all of the cultivated and wild host plants commonly found in the wilt infested area.

In 1936 a survey was made on 14 wilt-infested farms to determine the occurrence and abundance of susceptible weeds on fields to be planted to tobacco in 1937. Eight species of wilt affected weeds were found growing in and around the fields. In several instances wilt was found on weeds growing in fields which have been rotated to immune crops, and had not been planted to tobacco for three or four years. This data may explain the common observation that crop rotation does not always give satisfactory wilt control, and they indicate further that a small number of susceptible weeds may keep wilt infection alive in infested fields for long periods of time.

3. Cropping system studies planned to answer three questions: (a) What role do weeds play in the persistence of the disease in contaminated soils? A number of native weeds are highly susceptible. (b) Which immune crop, corn, sweet potatoes, crab grass or red top, can be most advantageously used in a control relation? Their individual cumulative effects on soil fertility and quality of tobacco will be measured. (c) Is it pos-



RESISTANCE TO GRANVILLE WILT. LEFT 79 A, 15% DEAD; RIGHT CASH, 92% DEAD. AUGUST 15, 1935.

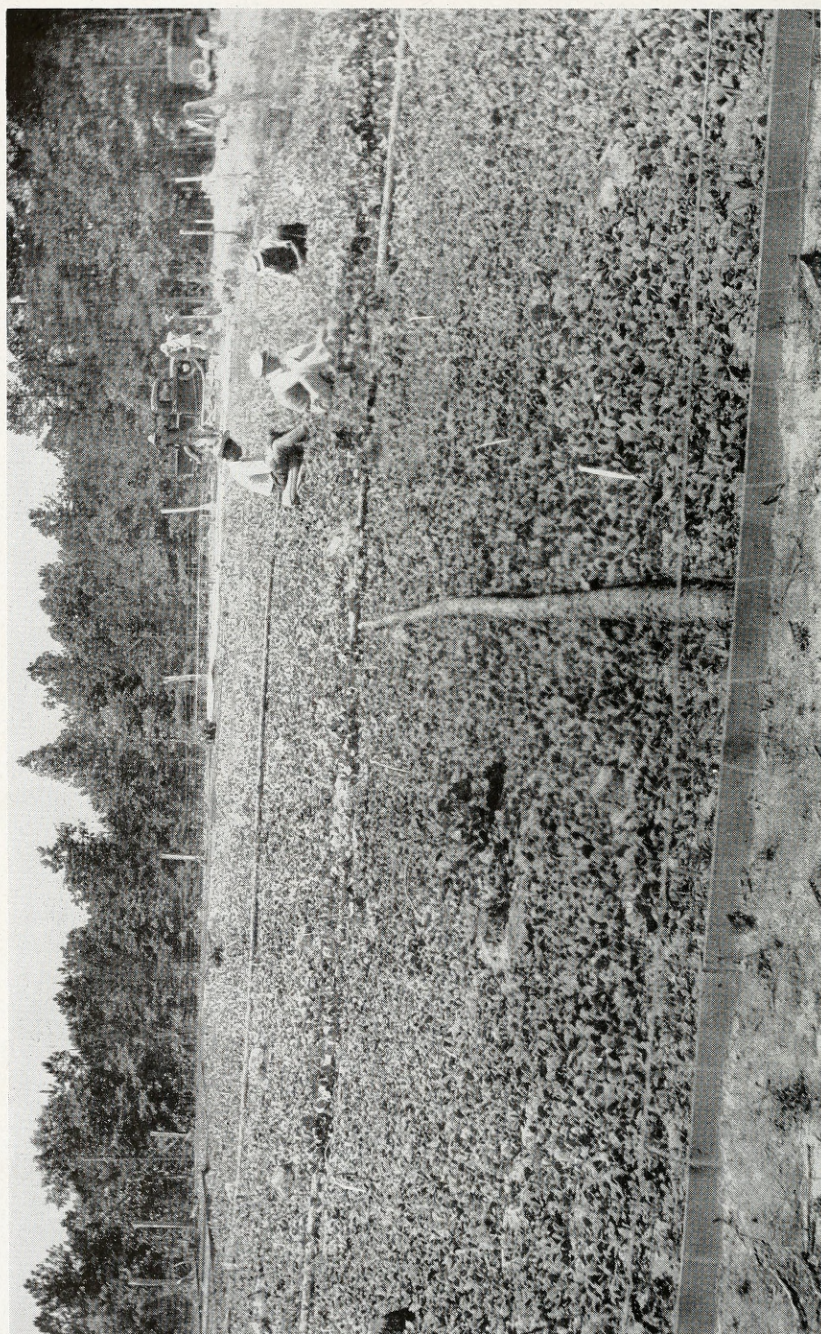
sible to use a summer legume in a control rotation? Susceptibility tests indicate that the three common summer legumes (soybeans, cowpeas and velvet beans) are not entirely immune and thus may act as latent carriers of infection.

4. Soil sterilization by means of chemical treatment. This work is carried on in coöperation with Dr. R. F. Poole, of North Carolina State College.

Downy Mildew: Control experiments have been conducted in conjunction with work carried on at Tifton, Ga.; Florence, S. C., and at Washington, D. C. During 1935 and 1936, the comparative effectiveness of four copper spray mixtures were tested. The most promising mixture (Copper oxide-oil) has been tested more thoroughly with some promise. During the plant bed season of 1936, a number of volatile gases were used. The results obtained cannot be definitely stated, only to say that indications are that something may be accomplished along this line. For the present it is recommended that the grower locate his plant bed in a place that is protected from north and west winds and has ample sunshine. Avoid planting old beds, unless they are thoroughly sterilized as the oöspores of this fungus live over in old beds. Use liberal applications of fertilizers.

TOBACCO INSECTS

Beginning July 1, 1935, the Bureau of Entomology of the U. S. Department of Agriculture established an office and laboratory in Oxford to study control methods of tobacco insects. This office works in coöperation with the Tobacco Station. The Station grew three and one-half acres of tobacco during 1935 for the Entomology people for experimental purposes. A number of sprays and dusts have been used during the growing season, and special attention has been given to the study of the two most common insect pests, viz: flea beetle and hornworm. This is the first season that work has been done in this area on tobacco insects, consequently no specific recommendations are made at the present time, but progress is being made. On account of not having sufficient office room on the Station to house the personnel of this new department, offices are maintained for the present on Kingsburg Street in Oxford. It is hoped that in the near future sufficient room for offices, laboratory and green-houses may be provided on the Station.



GENERAL VIEW TOBACCO SEED BED AT TOBACCO STATION.

SPECIAL PROJECTS

There are a few general projects which are carried on at the Station which are not considered purely research projects, but are of a more general nature and may be considered as an increase program as follows:

Small Grain: The selection of purple straw wheat which is grown on the Station seems to be furnishing a reliable source of good seed wheat for this area. The demand for this wheat continues to increase, and each year the demand is greater than the supply. At the suggestion of the Station, there is one grower in the community who is also growing purple straw wheat for seed, and his supply is exhausted each year. In tests made by the small grain specialists, this variety of seed wheat has given the best results for the middle Piedmont area.

Corn Selections: Weekley's Improved Prolific corn, which has proved to be one of the best varieties for the Piedmont area, continues to grow in popularity. Field selections are made each year and the best types are propagated.

Sheep: A small flock of Shropshire sheep are kept on the Station, and have proved to be profitable on a tobacco farm.

Community Herd-sire: This Station has maintained a pure-bred Jersey bull for the use of owners of small herds and family cows in the community. Rower Mountain Lad 357890, a son of Power's Seaside Lad 222459, out of Sybil's Eminent Paula 809646, is in service at the present time. This young bull is out of a proven sire and a tested dam. His daughters will soon be in milk, so an estimate of his transmitting ability can be made.

Swine: One pure-bred Berkshire boar and two to three pure-bred sows are kept on the Station. A number of pigs for breeding purposes are sold each year.

Hops: Three years ago it was thought advisable to try a small patch of hops to see if they could be grown in this area. The Seaboard Air Line Railway Company, through their agricultural agent, agreed to supply the roots. About one-quarter of an acre was planted. The yield has been small and unprofitable. The quality of the hops is regarded as fair. This plant seems to be quite susceptible to leaf spot diseases, which no doubt is responsible for the small yield.

PUBLIC RELATIONS

Increasing numbers of farmers and fertilizer manufacturers visit the Station annually. From January to March each year hundreds of farmers visit the Station to get information about the variety of tobacco to plant, and to have their tobacco seed cleaned. In addition to farmers from North Carolina, a large number from Virginia come for this service. It is estimated that between 1,500 and 2,000 pounds of seed have been cleaned each year during the past biennium.

The Annual Field Day was held on July 23, 1936, with approximately 4,000 people in attendance. In addition to this a Negro Field Day was held on July 24th, with approximately 500 Negroes present. The programs were well received, and a large number of farmers visited the experimental plots.

IMPROVEMENTS

During the past year all buildings on the Station have been painted and repaired. The office has been painted inside and outside with an additional room for use by the extra workers provided. A new tobacco barn has been built in which a system of forced ventilation was installed. A stoker with thermostatic control has been used during the 1935 and 1936 seasons. The results were satisfactory. An average of 1,200 pounds of washed pea coal per curing was used. This coal was brought for \$7.00 per ton delivered at the Station. The cost was low enough for practical use, as it compares with an average of $1\frac{1}{2}$ to 2 cords of wood per curing.

A granary 20 x 30 feet and an additional tool shed 20 x 72 feet have been built on the Station.

The following equipment was added during the past year:

- (a) $1\frac{1}{2}$ -ton Chevrolet truck with stake body.
- (b) Deep well pump with motor.
- (c) Single plows and cultivators.
- (d) Pair young mules.
- (e) Fencing hog and mule lots.

PIEDMONT STATION—STATESVILLE, N. C.

J. W. HENDRICKS

Station Established in 1903

Area of Station, 207 acres (State)

Soil Type, Cecil Clay Loam

133 acres (Federal)

Elevation, 950 feet above sea level

Climatological Data for 1935

Mean Annual Temperature, 58.9 degrees Fahrenheit

Annual Rainfall, 42.15 inches

Total Snowfall, 10 inches

The following will give the program of work and a brief progress report on the chief experiments under way:

LIVESTOCK

In Coöperation With N. C. Experiment Station

A Study of Pastures and Their Utilization by Sheep: Three uniform three-acre fields were seeded to the following:

Field 1—Permanent grass mixture consisting of 15 pounds Orchard grass, 8 pounds Red Top, 12 pounds Kentucky Blue grass, 5 pounds White Dutch Clover and 5 pounds Common Lespedeza.

Field 2—Abruzzi rye in the fall, followed by Kobe Lespedeza the next spring.

Field 3—Italian rye grass in the fall, followed by Korean Lespedeza the next spring.



SEEDING TEMPORARY PASTURE—ITALIAN RYE GRASS, SEPT. 4, 1936.

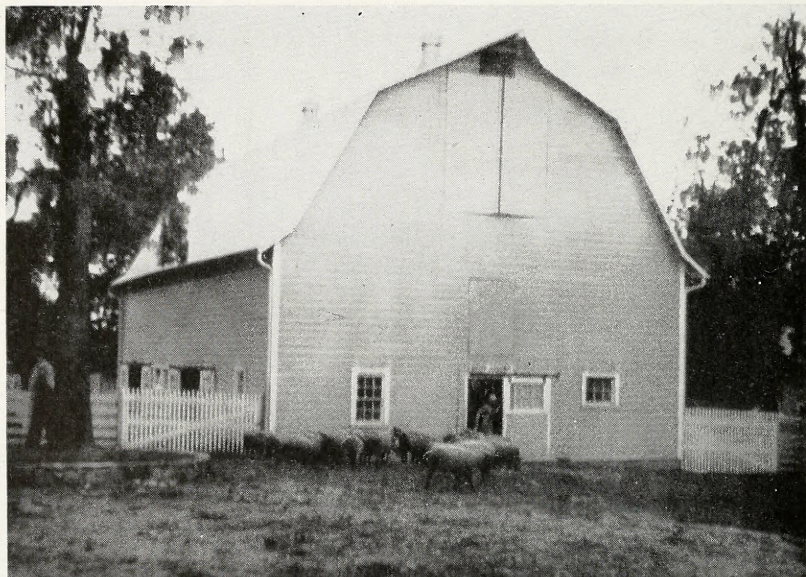
The Abruzzi rye and rye grass in Fields 2 and 3 each gave 9,500 sheep grazing hours, but the sheep in Field 2 made 25 pounds more gain than those in Field 3. During the period each group received 200 pounds of peanut hay in addition to their grazing.

From the beginning of the grazing period on permanent pasture and lespedeza until June 30, 1935, Fields 1, 2 and 3 furnished respectively 5,807, 5,795 and 6,400 ewe grazing hours and 4,816, 3,753 and 5,533 lamb grazing hours. Coöperating with Forage Crops.

Drenching Lambs for Stomach Worms: The drenching of sheep with nicotine sulphate solution has proved to be a satisfactory practice in the control of stomach worms.

Changes in Meat and Wool Characteristics: A study by weights, measurements and photographs of the improvements in the quality and quantity of meat and wool of sheep. Discontinued.

Breeding Stock: The Station furnishes ewes and pure-bred Hampshire rams as breeding stock when available, at reasonable prices.



SHEEP BARN BUILT 1936—PART OF IMPROVEMENT PROGRAM.

The Family Sow: This project is to determine the cost of maintaining two pure-bred sows and one pure-bred boar and their offsprings under general farm conditions. Breeding stock is sold to farmers of the section.

AGRONOMY

Coöperating With N. C. Agricultural Experiment Station

Fertilizer and Lime Requirements for Cotton, Corn, Wheat and Red Clover When Grown in Rotation on This Type of Soil: The main objectives of this experiment are as follows:

1. To determine the nitrogen, phosphoric acid and potash deficiencies of this soil type.
2. The proper proportions of nitrogen, phosphoric acid and potash that should be used for leading field crops.
3. To best quality of fertilizer to use per acre.
4. To study the symptoms of any nutrient deficiencies that may develop.

It has been found that when applied singly phosphoric acid is the most important nutrient to be supplied for production of cotton, corn, wheat and red clover, with nitrogen ranking second in importance, and potash the least important so far as yield



PURE BRED HAMPSHIRE EWE.

is concerned. However, for the control of potash deficiency ("rust") of cotton and frenching of corn potash is of primary importance to be added.

From observation on the cotton crop and corn crop on Field A, it is evident that potash deficiency of cotton is most severe in its damage where higher percentages of superphosphate are applied in the fertilizer mixture, or where it is used in large amounts. Results secured show that an application of one ton of limestone once in the rotation accentuates the potash deficiency symptoms of cotton, lowers the quality of the fibre and seed of the cotton.

For the production of red clover on this soil lime is not only essential to be added but liberal quantities of available phosphoric acid and potash.

Studies of the Efficiency of Superphosphate and Rock Phosphate as Source of Phosphoric Acid on Cecil Clay Loam Soil: When equal amounts of phosphoric acid are applied from superphosphate and rock phosphate, the superphosphate produces larger yields than rock phosphate. With the increasing quantities of rock phosphate applied the severity of potash deficiency symptoms and damage has been found to increase. This observation is evident on both the limed and unlimed series of plats, it being as in other cases always more pronounced on the limed series.

A Study of the Yield and Quality of Crops When Wheat and Corn Each Are Grown Continuously on the land; When Grown in a Two-Year Rotation of the Two, and when grown in a Three-Year Rotation of the Two With Red Clover on Cecil Clay Loam Soil: The most outstanding difference is between continuous corn without lime and a three-year rotation of corn, wheat and red clover with lime applied once in a rotation. The average yield of corn per acre where corn has been grown continuously with a complete fertilizer is 19.3 bushels, while the average yield of corn per acre in a three-year rotation of corn, wheat and red clover is 37.3 bushels.

Cotton Improvements: The Mexican Big Boll variety is grown exclusively at this Station. Pure line selection work is carried on each year, and high yielding strains of uniform staple have been developed, which are well adapted to the conditions under which they are grown. Last spring this Station distributed to growers 200 bushels of registered Mexican Big Boll Cotton seed, Strain 128-6.

Cotton Varieties: This project is to make a study of cotton varieties and strains with reference to new types that may be introduced from time to time.

Corn Breeding: To produce and maintain a high standard of Weekley's Improved, which has been leading in our variety work over a period of twelve years. The Station has been distributing approximately 100 bushels of registered seed corn per year.

Corn Varieties: To determine the best varieties adapted to this locality, the following table shows the results of our work for the past ten years:

VARIETY	Acre Yield
Weekley's.....	40.1
Jarvis Golden.....	38.8
Latham's.....	37.5
Southern Beauty.....	37.0

Small Grain Breeding: The production of varieties of small grain crops including wheat, oats, rye and barley which are superior in yield, adaptability and disease resistance is the object of this small grain work.

Registered and Certified Seed: The Station produces annually approximately 1,200 bushels of registered and certified seeds. The demand for quality seed is increasing from year to year.

Wheat Variety Tests: Over a period of twelve years we find Fulcaster the leading bearded variety, with an average yield of 29.9 bushels.

Oat Varieties: The Lee variety has proved to be the best winter oat for fall seeding in the Piedmont area of the State. It is more resistant to winter injury than any known variety. Over a period of twelve years it has been our highest yielder.

Barley Selections and Varieties: To develop more reliable types of barley with reference to yield, disease resistance and other favorable characteristics adapted to Piedmont North Carolina. We find the bearded varieties give us our best yields, while the objectionable feature is the harvesting and thrashing. The two outstanding varieties grown in this State are North Carolina Bearded, which is badly mixed, and Tennessee No. 6, a smooth barley which is comparatively pure. These varieties are both susceptible to smut diseases.

Head Selection (Barley): To develop more desirable types of barley, and to compare under uniform conditions those best adapted to Piedmont North Carolina as to yield and other desirable characteristics.

Rye Varieties: To determine the outstanding varieties adapted to this and other selections of North Carolina: Abruzzi gives us our best yield with but very little difference in Abruzzi and Balbo with reference to pastures, perhaps a slight advantage in favor of the latter, but in strength of straw the Balbo is very weak and is susceptible to lodging. The Station produces approximately 200 bushels of registered Abruzzi seed for sale each year.

Rust Resistance Studies With Small Grains: To obtain strains or varieties of small grains which are suitable to North Carolina. Also to determine varieties which are more resistant to leaf and stem rust than the varieties which are now commonly grown.

Pasture Fertilizer Tests: To determine the best fertilizer for pastures in Piedmont North Carolina and the time of applying same. Our study reveals that nitrogen is our limiting factor.

FORAGE CROPS

Coöperating With the Office of Forage Crops, U. S. Department of Agriculture and the N. C. Agricultural Experiment Station

Variety Test of Alfalfa: Due to thinning of stands of alfalfa plots seeded in 1930 and 1931, these fields were discontinued. Yields from cuttings made on May 27th, July 30th and October 1st were recorded on seedings made in 1932 and 1933. Yields of Alfalfa were low, due to extreme drought following both first and second cuttings.

Seeding Studies With Trifolium Procumbens: Monthly seedings of *Trifolium procumbens* on bare, closely clipped grass, and tall grass were made from September to March. The best stand was obtained from the November seeding on closely clipped grass. Seeding on bare areas and tall grass failed. Studies are being continued on different phases of the problem.

Study of Hay Yields and Adaptability of American and Foreign Lots of Red Clover: Excellent yields were obtained on the first cutting of red clover plots, established in 1934. Due to drought the second cutting was small. Recovery after the second cutting was slow and the stands were much reduced from drought and anthracnose.

Soybean Introductions and Selections: A total of 453 introductions and selections were studied. Eight introductions were studied in comparison with Herman and Laredo in a yield test of hay and seed. Eight green vegetable types are being increased.

Acid Soil Legume Introduction Garden: Notes were made on perennials established on eroded land in 1931 and 1932.

A new garden was established on a rich bottom land soil.

Date of Cutting Lespedeza: Korean and Kobe lespedeza were cut at six dates from August 8th to November 4th at approximate intervals of 14 days. Maximum yields were obtained from September cuttings.

Leafiness determinations made by the Bureau of Agricultural Economics showed lespedeza to have from 55 to 65 per cent leaves in comparison with 40 to 45 for alfalfa.

Strain Tests of Lespedeza Sericea: In two cuttings F. C. Number 12097 yielded 2,573 pounds; F. C. Number 19289, 3,021 pounds, and F. C. Number 04730, 3,317 pounds of oven dry hay per acre.

Reseeding With Different Width of Rows of Lespedeza Sericea: Seedlings failed to establish themselves in plantings of lespedeza sericea in row widths of 12, 24 and 36 inches, because of a thick volunteer stand of annual lespedeza.

Yields in lespedeza sericea in 8, 12, 24 and 36-inch rows were decreased in proportion to the width of row.

Comparison of Alfalfa With Lespedeza Sericea: Lespedeza sericea seeded on a Cecil sandy loam in 1933 with two tons of lime and 500 pounds of 0-10-4 fertilizer per acre in comparison with alfalfa, yielded 109 per cent in 1934 and 42 per cent in 1935 more than alfalfa.

COTTON BREEDING STATION

In Coöperation With the U. S. Department of Agriculture

Under a Public Works allotment of \$56,000 to provide land, buildings and other facilities for investigational work on cotton, a Federal Station has been established, adjoining the Piedmont Experiment Station at Statesville, N. C. Work at this Station is coöperative with the State Department of Agriculture, the State Experiment Station and other State Agricultural Agencies, with the object of improving the status of cotton production through (1) developing better cultural practices, (2) producing varieties superior in yield and quality and more resistant to diseases and other factors adversely influencing production, (3) studying the diseases of cotton and determining methods for their control, (4) determining the underlying principals concerned in the production of quality cotton and its improvement, and (5) develop-

ing and applying methods for utilizing and maintaining quality seed stocks, particularly through single-variety communities. These investigations are a part of a National program of improvements in production and quality of American cotton.

Fundamental to such a program is a more thorough study of existing varieties from a broad cotton belt standpoint. It is necessary to make a more complete inventory of the present cottons before the most intelligent sort of production is set up for further improvement. Varieties are now being studied with the view of determining the influence of soil, region, season and the kind of variety on yields, other useful factors and quality of fibre as measured by field performance, ease of picking, ginning tests, technical measurements of fibre properties, spinning tests, etc.

FORESTRY

Forestry Variety Work: To determine the best variety of pines in this section. In this experiment we are studying the value of forestry in connection with soil building and the ability of pine trees to prevent erosion. This experiment is only nine years old, however, but we are observing outstanding results, and we are beginning to thin for proper stand.

HORTICULTURE

Coöperating With N. C. Agricultural Experiment Station

Peach Fertilization: This is the third bearing year for this orchard. While no conclusions can be drawn, some significant differences are apparent.

From data received in 1935, the following observations are made:

1. There was practically no difference in total yield between treatments of unfertilized vetch cover crop plus nitrogen applied to the trees and unfertilized vetch alone. These were the two highest yielding plats.

2. N. P. K. applied to the trees under clean culture conditions ranked third in total yield.

3. Vetch cover top dressed with 200 pounds of a 4-12-4 fertilizer plus P. K. applied to trees gave the highest percentage of desirable fruit grades.

Measurements were made on 100 terminal branches from each plat, and the number of fruit heads determined.

Raspberry Fertilization: Plants fruited for the first time in 1935. Harvesting began June 12th, and continued through July 1. While no significance is attached to the yields for the first year, it is interesting to note that the difference between the yield of berries harvested from the highest and lowest plats was 667 pints per acre.

In addition to yield data, leaf counts were made and number, length and circumference of canes recorded. In connection with leaf counts, comparison was made between sprayed and unsprayed plants.

Disease caused rather severe defoliation. It is believed, however, that by adding one or two more Bordeaux sprays to the schedule, fungus diseases may be largely controlled.

Two red seedlings, U. S. D. A. No. 9 and N. C. R. 30, planted at Statesville in March, 1935, showed greater resistance to foliage diseases than Latham.

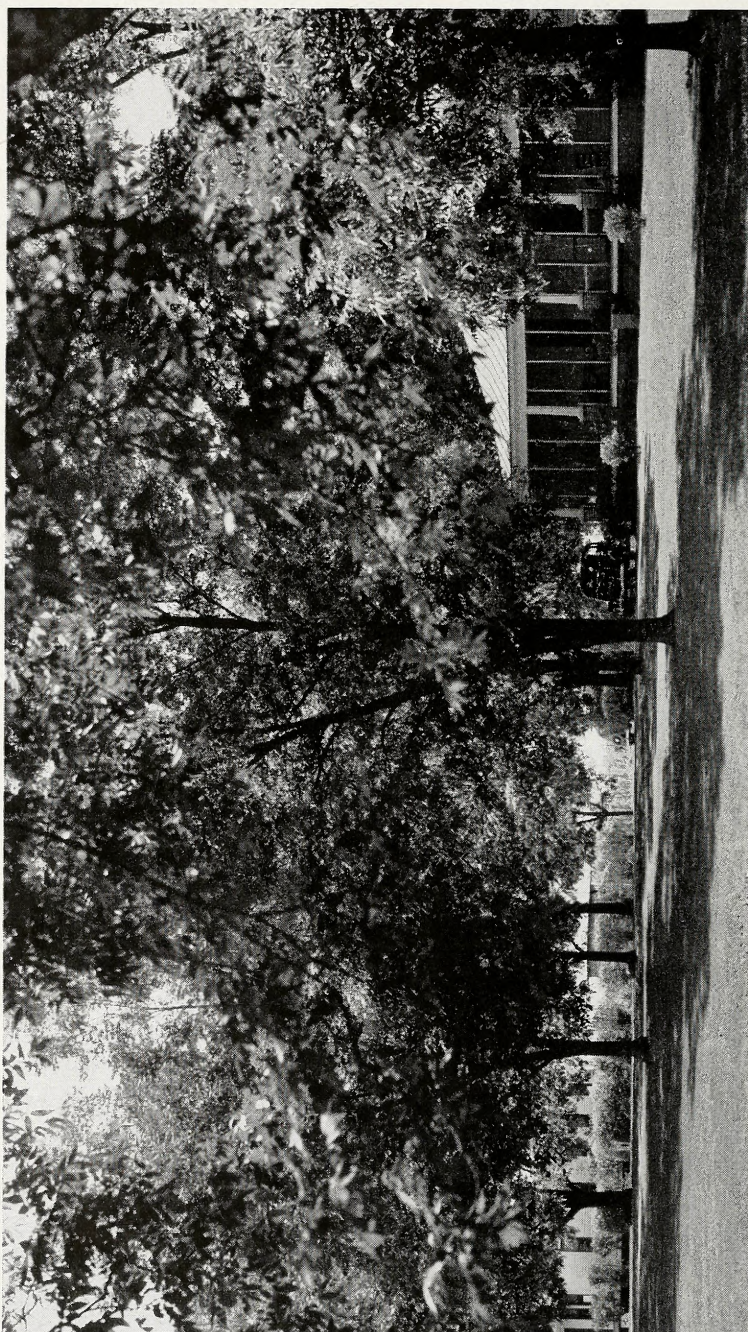
Fruit Variety Studies: This test has been continued with peaches, cherries, grapes, apples and small fruits to determine varieties best suited to Piedmont conditions.

PUBLIC RELATIONS

The 1936 Annual Farmers' Field Day was attended by approximately 2,500 people. This attendance, together with the increasing number of visitors throughout the year, will give some idea as to how the Station's activities are being appreciated by the public. We have an average of some 500 visitors each month, coming as individuals and in groups up to 300.

IMPROVEMENTS

During the past few years it has been necessary to retrench in our program of work due to the reduced budget. The experiments have not been neglected, but funds would not allow for necessary repairs and upkeep of our buildings and equipment. In January, 1936, an improvement fund was appropriated for the Piedmont Station. The improvements consisted of the following: One mule barn, 70x36 feet; one sheep barn, 56x36 feet; one granary, 60x42 feet; one bull pen, 14x14 feet, with lot; remodeling and painting old cow barn and tool shed; fencing around sheep barn; salvaging old mule barn. The total cost of the above improvements was \$6,365.50.



OFFICE AND SUPERINTENDENT'S DWELLING. UPPER COASTAL PLAIN STATION.

UPPER COASTAL PLAIN STATION—ROCKY MOUNT N. C.

R. E. CURRIN, JR.

Station Established in 1902

Area of Station, 202 Acres

Soil Type, Norfolk Sandy Loam

Elevation, 100 feet above sea level

Climatological Data for 1935

Mean Annual Temperature, 61 degrees Fahrenheit

Annual Rainfall, 41.37 inches

Total Snowfall, 10.5 inches

Agricultural conditions in 1934 and 1935 continued to show improvements over the depression years, and the farmers, as a whole, in this section are more hopeful. We are pleased to note that this Station is being used more each year by farmers and others interested in agriculture.

The program of work with a brief summary of results is reported below:

AGRONOMY

The tobacco experiments are handled in coöperation with the Office of Tobacco Investigations, U. S. Department of Agriculture.

Tobacco Variety Test: Most of the leading varieties of tobacco have been tested, and the Virginia Bright Leaf, Hickory Pryor and Gold Dollar seem best suited to this section of the State. Individual plant selections are being made each year from these varieties and several strains have been developed which show improvement of the original. Two strains of Virginia Bright Leaf show considerable promise and are very much in demand by the farmers of the Bright Tobacco Belt.

Split Application of Fertilizer for Tobacco: This series of plats were begun in 1931 to determine the effect of fractional application of fertilizer on the quality and yield of tobacco. So far the information secured indicates that split applications have not been of very much value except during periods of excessive rainfall. In some instances an additional application of fertilizer containing 5 to 10 pounds of Nitrogen, and 25 to 50 pounds of potash on very light sandy soil has been beneficial. Whenever a second application is made, it is recommended that it be applied not later than twenty days after planting.

Sources of Potash Test: This series was begun in 1927 to determine the best source or sources of potash for tobacco. The basal mixture is an 3-8-5. A mixture containing one-half of the potash from muriate and one-half from sulphate of potash mag-

nesia has given best results. Where magnesia was applied to the muriate plats the results were practically the same as the muriate and sulphate of potash magnesia.

Lime, Sulphur, Chlorine and Magnesia Test for Tobacco: This series of plats were begun in 1932. The only indication so far has been the need for magnesia. Sand-drown appearing on the no-magnesia plats, and in some instances where 20 pounds of magnesia were applied.

Disease and Insect Study of Tobacco: A field containing five acres was planted in 1936 to tobacco as a preliminary step to the study of nematode control.

Agronomy experiments in coöperation with the N. C. Agricultural Experiment Station.

A Study of the Influence of Certain Dusts and Sprays Upon the Growth, Yield and General Characteristics of Peanuts: These investigations, started in 1929, have been expanded to include greenhouse and concrete frame and field experiments to determine the effects of dusts, fertilizer, lime and soil amendments upon (1) bases absorbed by peanut plants; (2) number of blooms and duration of blooming period; (3) nodulation of plants; (4) number of "pegs" and their relation to blooms; (5) size, quality and shelling percentage and yield of nuts; (6) reaction of the soil; (7) total soluble salts in the soil; (8) exchangeable bases in the soil, and (9) the availability of calcium from various materials to peanut plants on different soil types.

Two publications covering phases of this work have been prepared. North Carolina Agricultural Experiment Station Bulletin No. 281, giving approved practices for peanut growers, was issued in 1933. Paper No. 82 of the Journal Series of the Experiment Station, "The Relation of Soil Treatment to the Nodulation of Peanuts," has been accepted by Soil Science for publication.

Calcium carbonate applied at the rate of 2,000 pounds per acre to virgin Norfolk (pH 5.3) and Coxville (pH 4.5) soils increased nodulation of peanuts throughout the growing season. Similar applications to a cultivated Norfolk soil that had been previously limed to pH 6.6 did not increase nodulation. During the latter part of the growing season, there was a slight reduction of peanut nodulation from the use of calcium carbonate on the soil. Varying applications of calcium carbonate to virgin acid soils had quite different effects upon peanut nodulation. Moderate applications stimulated and increased nodulation, but heavy applications retarded and reduced it. These results offer an explanation for the conflicting reports as to the effect of lime

on legume nodulation. Calcium sulphate broadcast at the rate of 2,000 pounds per acre delayed and reduced nodulation on all soils studied. Probably due to high acidity produced, sulphur applied at the rate of 400 pounds per acre prohibited nodulation of peanuts at all stages of growth.

As in previous years, peanuts grown on acid soils low in calcium were improved by applications of calcium sulphate on the following at blooming time. Similar applications to peanuts, growing on heavily limed soils well supplied with calcium, were ineffective. The response of peanuts to calcium sulphate seems to be due to the available calcium supplied by the calcium sulphate.

A Study of the Utilization of Crops Grown in Rotation With Cotton by Two Different Methods: This coöperative experiment with the Animal Husbandry Department, inaugurated in 1927, to compare crop yields, financial returns and fertility of the soil under two methods of crop utilization. There are three one-acre plats grown to a three-year rotation. Plate 1 is fertilized normally and all cover crops are turned under for soil improvement. Plat 2 is fertilized the same as No. 1, but all crops are "hogged off" except cotton. Plate 3 is "hogged off" the same as No. 2, but in fertilizing, credit is taken for 80 per cent of the fertilizing value of supplementary feeds given hogs. As indicated by the yields of seed cotton in 1934 (plat 1, 874 pounds; plat 2, 1,209 pounds; plat 3, 910 pounds per acre) the fertility of the soil in plat 2 is being maintained at a higher level than either No. 1 or No. 3, which are producing about the same yield per acre.

Cotton Breeding With Special Reference to Meeting the Needs of the Manufacturers of the State: In this project, which was started in 1917, breeding methods have been principally line selection with the Mexican variety. Variety hybridization, as means of developing new types for commercial production, has not been undertaken. Crosses have been made between distantly related strains of the same variety, but this method seems less promising than line selection.

At this Station, Strain No. 87-8 is being grown and distributed to farmers. It stands at the top, in variety tests, in both yield and money value, and has good spinning quality. The staple is 1-32 of an inch shorter than 128-6, and the fibre is slightly coarser. Thirty more recent selections were put in the advanced strain test in 1935.

A Study of Factors Which Influence the Size and Quality of Peanuts: In this project, which has been active since 1926, selection work with the Virginia Bunch variety is being continued.

Fifteen selections were grown in this strain test in 1935. These have survived after discarding a large percentage of the plant-to-row selections and the less promising strains. These selections show considerable differences in yield, percentage of handpicks and large nuts, and in total production of handpicks and shelled nuts, grown during the past year, showed an improvement over the parent variety in one or more of the above characters and in uniformity of pod and seed size.

The other strains which have been in the yield test only one year are promising from the standpoint of yield, size and quality.

Cotton Fertilizer Placement Experiment: This experiment, located at the Upper Coastal Plain Experiment Station on Norfolk sandy loam soil, was started in 1931 to study the effects upon germination, growth and yield of cotton with the fertilizer placed in different positions and at different distances from the seed. Reports on the project have been made before the section on Fertilizer Placement of the American Society of Agronomy and published by the National Fertilizer Association in 1932, 1933 and 1934.

From 1931 to 1933, inclusive, practically the same placements were used. The results from the experiments showed consistently greater efficiency from the fertilizer when applied in bands to each side of the seed, rather than directly under the seed as is the general practice. There was direct correlation between the amount of injury and the total soluble salts around the seed and seedlings.

In 1934, the outline was revised, some of the placements that had proven to be of little value were dropped and others added. As conducted in 1934, the experiment compares the efficiency of fertilizers when applied: (1) in a narrow band at various depths below the seed; (2) in a band to one side of the seed; (3) in contact with the seed; (4) mixed with the soil below the seed; (5) in bands to each side of the seed; (6) at varying rates per acre below and to each side of the seed, and (7) bedded on two weeks before planting.

As in previous years, the placements to the side of the seed were superior to all others. Placement to only one side of the seed gave practically as good results as when the fertilizer was applied on each side of the seed. From the standpoint of germination, earliness and final yield, the best placement of fertilizer for cotton is in bands 2.5 inches to each side, and two inches below the seed. Good results were obtained by applying the fertilizer and bedding on it about two weeks before planting. Where the side application is not used this practice is recommended.

Fertilizer Experiment With Rotation of Corn and Soybeans: This experiment was started in 1926 to determine the best fertilizer for corn, soybeans (for seed), soybeans (for hay) and to show the effect upon the succeeding crop of corn by picking soybeans for seed, remaining parts turned back for soil improvement, versus cutting the soybeans for hay. Corn planted after soybeans are gathered for seed yields from 30% to 50% more than where soybeans are cut for hay. Corn and soybeans both lodge badly where insufficient amounts of potash are applied. Soybeans are very susceptible to fertilizer damage, germinating very poorly where large amounts of fertilizer are applied below seed at planting.

Rotation Experiment: There are thirteen different rotations run in duplicate in this test. The experiment was started in 1924 to study the value of one-, two-, three- and four-year rotations with and without legumes. So far the corn and peanuts have responded most to the rotations. The increase in corn yields, due to a three-year rotation where legumes are used, has been as much as twenty bushels per acre over the continuous corn plat. In rotations where large amount of legumes have been turned under, cotton shows potash deficiency unless additional potash is added to the normal application.

Corn Selections: The Latham Double variety of corn is used exclusively at this Station. Each year field selections are made to improve the yield and quality.

Tobacco Mosaic: Coöperating with the N. C. Agricultural Experiment Station. A study is under way to determine how long the mosaic will remain active and capable of producing disease in soil. As has been previously announced, when soil, containing virus particles free of tobacco issue, becomes approximately air dry, the virus is inactive and does not become active and capable of producing disease again when water is added to the soil.

HORTICULTURE

Coöperating With N. C. Agricultural Experiment Station

Pecan Orchard Management: To compare the effect of clean culture, sod culture and a cover crop system on the yield of pecans:

The crops for the past two years were small and showed no significant differences between the treatments. Previous results indicate that in a dry season yields are apt to be better in cultivated rather than in sod orchards.

Sweet Potato Storage: This work has been continued and additional information has been secured on the value of the Government type of a sweet potato storage house.

LIVESTOCK

Coöperating With the N. C. Agricultural Experiment Station

Sheep: A small flock of sheep is kept at this Station and information is secured on methods of handling sheep under general farm conditions.

Hogs: The purpose of this project is to secure cost records on carrying over brood stock and to supply the pigs for the crop utilization project outlined under agronomy. The Tamworth breed of hogs is raised at this Station.

PUBLIC RELATIONS

The Annual Field Day, held this year on August 6th, was successful in every way. The attendance was good and those present seemed interested in the work carried on at the Station.

The Negro Field Day, held on August 7th, was attended by approximately 1,000 Negroes. Several smaller meetings were held during the year. The County Agents and Teachers of Vocational Agriculture bring groups to study different experiments. The commercial people, particularly the fertilizer manufacturers, are becoming more interested each year in the work of the Station.

IMPROVEMENTS

During the spring of 1936 a special fund was appropriated by the Department of Agriculture for improvement work. All tenant houses and barns were covered with galvanized roofing, except the hog barn, which had been covered previously. The office and the house of the tobacco specialist were covered with tin and painted. A new fence was erected around the pecan orchard, also around the hog and horse barns. A new chicken house was built and lots were fenced for the poultry. The office was painted inside and out.

The following equipment was added:

- a. I. C. H. tractor F-20
- b. Tractor disc harrow
- c. One ton Chevrolet pick-up truck
- d. Pair young mules
- f. Furniture and fixtures for office building
- g. Two-horse farm wagon

BLACKLAND STATION—WENONA, N. C.

JAMES L. REA, JR.

Station Established in 1912

Area of Station, 362 Acres

Soil Types, Peat and Muck

Elevation, 16 feet above sea level

Climatological Data for 1935

Mean Annual Temperature, 59.6 degrees Fahrenheit

Annual Rainfall, 41.9 inches

Total Snowfall, 9.3 inches

The program of work at this Station is planned with the view of developing the kind of agriculture best suited to the Blackland area of Eastern North Carolina. This region comprises approximately one million acres of land.

In addition to the 362 acres of land owned by the Department of Agriculture, the Station is continuing to rent eighty acres for the growing of certain feed crops for the extensive livestock experiments, and 160 acres of reed land adjacent to the Station are leased annually for grazing beef cattle.

The major lines of work under way deal with livestock and feed crops, and the projects are listed below with a brief report of the progress being made.

LIVESTOCK

*Coöperating With the N. C. Agricultural Experiment Station
and the Bureau of Animal Industry of the U. S.
Department of Agriculture.*

Protein Supplements for Fattening Pigs: Two trials were conducted during the past year comparing mixtures of varying amounts of fish meal and cotton seed meal with fish meal alone as supplements to shelled corn. Sixty-four pigs were divided into four equal groups in the first trial, and the test was repeated in the second trial with sixty pigs. The protein supplement for the pigs in Group 1 consisted of fish meal alone, for Group 2, a mixture of equal parts of fish meal and cotton-seed meal; for Group 3, fish meal one-third, and cotton-seed meal two-thirds, and for Group 4, fish meal one-fourth and cotton-seed meal three-fourths. An average of the two trials showed that pigs fed the protein mixture of equal parts of fish meal and cotton-seed meal produced more rapid gains, required less feed per unit of gain and were more profitable than either of the other two groups.

Comparative Study of Quality of Meat of Native vs. Grade Hereford Yearlings: The following conclusions were drawn from the results of four separate trials in connection with this project:

a. Grade Hereford calves (Hereford x Natives) gained .14 lb. more per day during the summer than Native calves and weighed 53 lbs. more when weaned in November.

b. Grade weaned calves gained .15 lb. more per day during the winter than the Natives, but there was no appreciable difference in their gains the following summer.

c. Grade Yearlings made 62 lbs. more gain per head in the feed lots than the Natives.

d. Eleven per cent more concentrates and six per cent more soybean hay were consumed per head daily by the Grades, but the Natives required 13.5 per cent more concentrates and 17 per cent more soybean hay to produce 100 pounds of gain.

e. The cost of gains was \$1.31 per cwt. cheaper for the Grades.

f. The dressing per cent was \$1.09 higher for the Grades than for the Natives.

g. The Grade Herefords graded one full grade higher than the Natives as feeders, slaughter cattle, and in the carcass.

h. The differences as brought out by the laboratory, cooking, and palatability tests, where if any, were slightly in favor of the Grades.

i. Everything being taken into consideration the use of the purebred bulls greatly increased the profitableness of the enterprise.

Value of Native Reeds for Summer Grazing: Native reeds (*Arundinaria tecta*) have furnished excellent grazing for cattle at the Blackland Station, Wenona. During the past year 33 native cows and their 28 calves, sired by a Hereford bull, were grazed on reeds from May 8th to November 23rd, or a total of 199 days. The cows during this period made an average daily gain per head of .51 pounds, while their grade Hereford calves gained an average of 1.23 pounds per head daily.

Comparative Gains on Reed Pasture vs. Tame Pasture:

During the grazing season of 1934, ten representative grade Hereford yearling steers and heifers were compared on tame permanent pasture with 22 similar ones on reed pasture.

The tame pasture was grazed from April 20th to October 26th. During the 189-day period the yearlings made an average daily gain of 1.18 pounds.

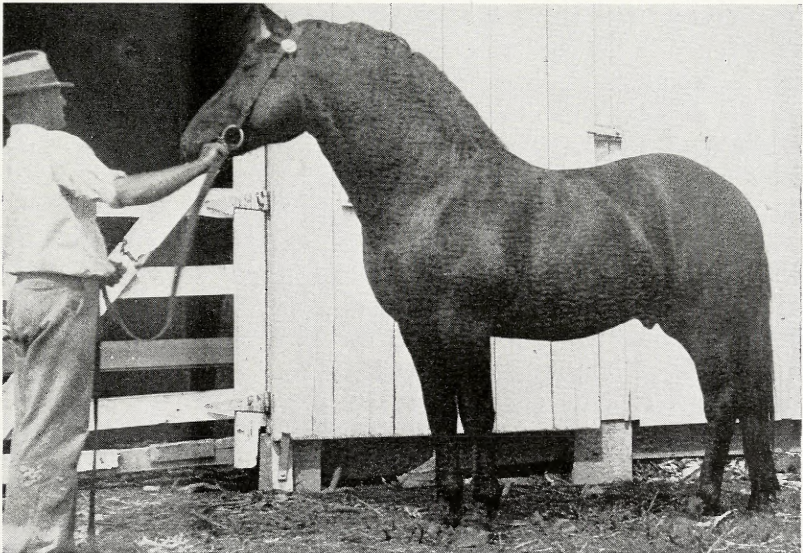
The reed pasture was grazed from May 8th to October 26th, and for this 171-day period produced an average daily gain of .81 pound.

An attempt was made to compare the carrying capacities of the two pastures also, but due to the drought, which made it necessary to move the groups to additional areas of similar pastures, and the irregular stand of the reeds, it was not possible

to accurately determine this. However, as is shown above, the tame pasture was ready to graze 18 days earlier than the reed pasture. The reeds though, after May 8th, furnished more grazing per acre than the tame pasture and were hurt less by the drought.



BREEDING HERD OF HEREFORD CATTLE ON THE BLACKLANDS.



TWO-YEAR-OLD PERCHERON STALLION.

On October 26th, both groups of yearlings were turned in a reed pasture area previously grazed by the cows, and the yearlings and cows were wintered on reeds reasonably well until January 18th, at which time the cows and heifers were moved

to the stalk fields on the farm. The 15 steers, averaging 594.33 pounds, were then turned in an ungrazed reed area of 32 acres and left until March 29th. During this 70-day period they lost an average of .17 pound per head daily, but were in strong condition. If they had been taken out on March 15th they would have shown an average daily gain of .14 pound, and on March 1st an average daily gain of .43 pound.

All gains from September 1st on were reduced by an outbreak of "Pink Eye."

Value of Crop Gleanings for Wintering Beef Cattle: The fifth year's gleanings studies were with 33 dry native cows and 17 grade two-year-old heifers. They were turned in the stalk fields on January 18th, and removed from the area on February 27th. During this 40-day period the 50 head gleaned 52 acres of corn and soybean fields, making an average daily loss of .50 pound per head or 19.90 pounds loss for the period. The corn had been harvested and made an average yield per acre of 34.23 bushels. The soybeans were not harvested. When the weights were taken on February 27th there were 19 young calves, so the calf weights were added to the cow weights. Here, too, as in 1934, the larger loss in weight and fewer number of cow days than in former years was largely due to the late date at which they were turned in the stalk fields. The herd was turned into additional stalk fields on February 27th, but in this area they also had access to rye grazing.

An average of the five years' trials shows that this cow herd, which calved in February, March and April, practically maintained its weight on gleanings alone over an average of about 65 days, extending from around the 10th of January to about the middle of March. Some roughage was also furnished after this date, but not enough to maintain weights.

A Study of Methods of Establishing Permanent Tame Pastures: Two acres of land are being used that were seeded to permanent pasture in March, 1929. This land was originally swampy and covered with juniper trees, but prior to 1929 it had been cleaned and tile drained and had produced eight crops of corn and one of cowpeas. No fertilizer has been applied, but one to one and one-half tons of lime was applied at two-year intervals. Only a fair stand of grasses was noticeable in the spring

of 1934, and these consisted primarily of blue grass and lespedeza, the lespedeza having been reseeded in March, 1934.

Eighteen 1-20-acre plats have been treated as follows:

1. Manure, 4 tons per acre.
2. Manure, 4 tons per acre and 50 pounds copper sulphate.
3. Top soil, 4 tons per acre.
4. 2-8-8 fertilizer, 400 pounds per acre.
5. 2-8-8 fertilizer, plus 50 pounds copper sulphate, 400 pounds per acre.
6. 0-0-24 fertilizer, 400 pounds per acre.
7. 0-0-24 fertilizer, plus 50 pounds copper sulphate, 400 pounds per acre.
8. No fertilizer treatment except lime.
9. No treatment.

Plats 10 and 18 were planted to soybeans in June, 1934, 1935, 1936. These were plowed under during the fall of 1934, 1935 and seeded to Abruzzi rye. In the spring of 1937 these plats will be seeded to a permanent pasture mixture and fertilized in the same way as plats 1 to 9. All plats except Nos. 9 and 18, will receive an application of one ton of lime per acre every other year.

At the end of the conditioning period, spring, 1937, it is proposed to seed across all plats segments of pasture grasses as follows: Blue grass, lespedeza (annual), orchard grass, Dallis grass, white clover, carpet grass and a mixture of the above minus carpet grass.

Improvement of the Family Milk Cow by the Use of Pure-Bred Guernsey Sire: The Station has maintained a pure-bred Guernsey bull as a community sire to improve the quality of family cows and small herds in the Station area.

Dauntless of Garden Creek 213980 the third sire is now in use. In selecting these bulls much attention has been paid to production, although improvement in type has been kept continually in mind.

The dairy cattle of the community show a marked improvement in uniformity of type, color and breed character. The community has shown an active interest in the project and much improvement in the quality of dairy cows is the result.

Work Stock Improvement: There is an urgent need for more and better work stock in North Carolina, and this Station has taken the lead in encouraging the raising of good work stock in Washington and adjoining counties. In the spring of 1934, a pure-bred Percheron stallion and two Percheron mares were purchased, and at the present time the Station's Percheron work stock consists of two registered stallions, four mares and four colts. The stallions are available for community service.

The Farm Flock of Sheep: A flock of twenty ewes and a pure-bred Hampshire ram are included in the Station's livestock program. Information is secured on the feed costs and returns from wool and lambs. The Station also furnishes breeding stock at reasonable prices to farmers interested in the industry.

AGRONOMY

Coöperating With the N. C. Agricultural Experiment Station

Rock Phosphate, Superphosphate and Duplex Basic Slag Compared as Sources of Phosphoric Acid for Corn; Oats Followed by Soybeans for Soil Improvement, and Irish Potatoes Followed by Soybeans for Soil Improvement Grown in a Three-Year Rotation: The results from this experiment show that all the crops in the rotation respond more to potash than to either nitrogen or phosphoric acid. The crops show little or no response to applications of phosphoric acid from superphosphate, basic slag or finely ground rock phosphate. The plats that were treated with phosphate have produced yields less than the untreated plats.

A Study of the Rates of Application of Different Forms of Lime for Corn Grown on Peat Soils When Used With and Without Fertilizer: The results from the 1935 corn crop further substantiate the findings of previous years that ground limestone is the most efficient source of lime, while hydrated lime and marl are second and third in efficiency, respectively.

A complete fertilizer used in addition to lime has produced a profitable increase in yield, while a complete fertilizer without lime has produced yields less than lime alone. The plats that have had no lime treatment are almost entirely barren of crop growth, due to excess acidity, showing that the use of lime is highly essential for crop production on this soil.

A Study of Different Cultural Methods in Relation to Stand and Yield of Corn and Soybeans When Grown in a Two-Year Rotation: The yield records, over a period of nine years, have shown that larger yields of both soybeans and corn have been secured where the soil has been disked four inches deep than where the soil has been plowed eight inches deep. Rolling the soil before planting has had no effect in increasing the yield.

The use of the ridge method of cultivation of crops grown on this soil gives no better results than does the use of level cultivation under average seasonal conditions. Larger yields are obtained only by use of the ridge method in very wet seasons. Discontinued 1935.

Fertilizer and Lime Requirements for Corn and Soybeans Grown in Rotation, the Soybeans Being Produced for Seed in One Series and Utilized for Hay in a Second Series: Soybeans were grown on this experiment in 1934, and the results become more outstanding each year. The largest yields have been produced on plats that received high percentages of potash, very low percentage of phosphoric acid and low percentages of nitrogen.

It is interesting to note that in this experiment where 400 pounds of a 0-4-5 (Plat No. 12) was used on corn that the yield of corn was 47.7 bushels per acre where the soybeans had been picked, and the vines turned under, and where the previous crop of soybeans was cut and removed for hay, the yield was 6.6 bushels less per acre.

Where the phosphoric acid in the mixture was increased from 4 to 8 per cent (Plat No. 11) the yield of corn was only 38.9 bushels following soybeans picked and 34.4 bushels following the soybeans cut for hay, a difference of 4.5 bushels per acre.

Where 20 pounds of potash from manure salt alone (Plat No. 7) was applied the yield of corn following soybeans picked was 42.8 bushels and following soybeans cut for hay 33.9 bushels, a difference of 8.9 bushels per acre.

Unfertilized, the corn in 1933 yielded only 21.3 bushels, which was 1.3 bushels more per acre where the soybeans had been picked than where they were cut for hay (20.0 bushels).

Effects of the Use of Lime and Potash on the Yield of Corn When Lime is Applied Broadcast at Four-Year Intervals and When Applied in the Drill Annually in One-fourth the Quantities That Are Applied Each Four Years: One year's results from this experiment give no indication of what may be expected from these treatments.

Copper Sulphate Tests: For several years the methods of management and fertilization of peat and muck soils in North Carolina were a puzzling problem. When newly cleared these soils were highly productive, but within a few years decreases in certain crop yields were experienced, and the ordinary methods of soil improvement were ineffective to the extent of developing the original productiveness.

In the laboratory the cause of the unproductiveness of these soils was found to be associated with a peculiar characteristic of the organic matter, which on decomposition, increased the solubility of iron in the soil to an injurious degree. The field experiments indicate that copper and potash will correct this injury.

This experimental work has progressed to the point where applications of copper sulphate applied at the rate of 50 to 100 pounds per acre broadcast will greatly increase the productivity of soils on which corn and soybeans are grown.



SOYBEANS ON PEAT SOIL. LEFT WITHOUT COPPER SULPHATE, RIGHT COPPER SULPHATE ADDED AT A RATE OF 75 POUNDS PER ACRE BROADCAST.

Fiber Flax Test: In coöperation with the Office of Fibre Investigations, U. S. Department of Agriculture and the Textile Foundation Institute, this flax test of one acre was started in the spring of 1934, and harvested during July of that year. The yield was approximately two and one-half tons per acre. The flax was shipped to Clemson College, South Carolina, for further studies as to qualities for spinning, etc. This work was discontinued in 1935. For the season 1936, flax tests were conducted in coöperation with the Champagne Paper Corporation of Estill, South Carolina.

Seed Corn Selections: Progress is being made in selecting Highland Horse-tooth and Jarvis Golden varieties of seed corn for resistance to root-rot and for increased yields.

PUBLIC RELATIONS

The Annual Farmers' Field Day was held this year on July 16th, with approximately 2,000 people in attendance. On April 8th, 1936, a special livestock meeting was held, and 125 livestock

farmers were present. The meeting was given over to discussions of the livestock work on the Station, and a study of the experiments under way.

In addition to the attendance at the meetings, approximately 2,500 people visit the Station each year seeking information on the better methods of growing crops on the blackland soils, and the feeding and management of livestock. Many more folks would take advantage of the work of this Station if the roads leading to Wenona were in better condition. A good surfaced road to Wenona is *the most urgent need* of the Station at this time.

Improvements and Additions to Equipment: Improvements made during the biennium have added much to the efficiency of the Station and have made possible an expansion of the program of work. The improvements completed and additions to the equipment are as follows:

1. Two-story office building with furniture, equipment and plumbing fixtures.
2. Swine farrowing barn 26' x 60' with loft above for the storage of feed.
3. Ditching and laying 11,250 feet of farm drain tile.
4. The purchase of 160 acres of land for beef cattle investigations.
5. The purchase of the Wenona school house property, consisting of the old school building and two acres of land. The building has been remodeled into a six-room dwelling and is now occupied by the Station's Field Foreman. The Wenona school was closed two years ago, and the children of the community go by bus to the school in Plymouth.
6. One-half ton Chevrolet pick-up truck.
7. McCormick-Deering manure spreader.
8. John Deere power hay press.
9. Two Percheron mares and a two-year-old registered Percheron stallion.

VETERINARY DIVISION

W. M. MOORE

No cattle fever ticks have been found during the period covered by this report. A very large number of inspections have been made in connection with the inspection of cattle exposed to drought relief cattle and the inspection of other cattle. I believe that the cattle tick has been completely eradicated from this State.

BOVINE TUBERCULOSIS ERADICATION

This work has been confined to the testing in counties on which the three-year accreditation period has expired, State-owned herds (22) the herds of charitable institutions, herds to which imported cattle have been added and herds known to be infected. A comparatively small number of diseased animals were found. During the fiscal year ending June 30, 1935, there were 24,572 cattle tested for tuberculosis, of which 64 reacted. For the year ending June 30, 1936, there were tested 30,334 cattle, of which 14 reacted. All of these diseased animals were slaughtered and the owners paid an indemnity amounting to \$1,424.71 in the first period and \$254.31 in the second period, a like amount being paid by the U. S. Bureau of Animal Industry.

Numerous requests for testing are received which we are not able to take care of. This is a purely personal service and in many instances the cost of testing would be greater than the value of the animals tested. Such testing can be done by local veterinarians at much less cost than the expense to us.

Very satisfactory coöperation with the U. S. Bureau of Animal Industry has been maintained. I wish to mention the fact that North Carolina was the first State to complete the testing of all cattle in the United States. This has since been done by thirty-nine other States.

Johne's disease, or paratuberculosis, has been found in some herds. All of these herds have passed a second negative test and were released from quarantine. This is a chronic wasting disease, the principal lesions being found in the intestines. The organism causing this disease resembles somewhat the organism causing tuberculosis. A diagnostic test for detecting this disease has been perfected, but it is not so satisfactory as the tuberculin test for tuberculosis. By the continued use of this test and the practice of strict sanitation, the disease may be eliminated.

HOG CHOLERA AND OTHER SWINE DISEASES

Hog Cholera has been quite prevalent, especially in the eastern part of the State. In general the disease has been more prevalent than in some other periods. Hog Cholera continues, as in the past, to cause more loss than any other disease of swine, notwithstanding that the cause and prevention have been well known for more than 25 years. The promiscuous use of virus, the purchase of new animals and the feeding of infected garbage or table scraps, continues to be the chief cause of the spread of this disease.

We have an abundance of evidence to show that much serum and virus is needlessly used by untrained men, not only resulting in a waste of money, but often starting real outbreaks of cholera. Yet, recent sessions of the Legislature have by special acts granted permission to individuals, unqualified and untrained, to use serum and virus promiscuously. We can never hope to control cholera so long as this continues. We have demonstrated that cholera can be controlled more satisfactorily in an area by proper veterinary investigation and inspection, etc., at much less cost than the cost alone for serum and virus used promiscuously by untrained men.

In my opinion hog cholera will never satisfactorily be controlled until we adopt a general policy throughout the State of restricting the use of virus, quarantining diseased animals and handling this disease with a trained personnel just as other diseases have been properly handled in the past. The loss from cholera certainly justifies this being done. There are other diseases of swine, especially internal parasites, that are causing an enormous loss and are making it increasingly difficult to raise pigs. In a proper plan of hog cholera control these diseases could be taken care of.

A new vaccine for the prevention of hog cholera known as crystal-violet vaccine, is now being tried out on a limited scale. This vaccine has the advantage of not being able to produce hog cholera and the disadvantage of requiring several weeks to establish immunity against cholera. This vaccine is still in the experimental stage and is not being generally used.

PULLORUM DISEASE CONTROL IN POULTRY

At the urgent request of the organized hatcheries of the State, two additional inspectors were put on during the 1934-35 season and again in the 1935-36 season, making a total of four inspectors. By this action we are able to do the testing more promptly, to test more flocks and to complete the work in less time than

heretofore. On account of the very bad weather during December, 1935, and January and February, 1936, and the fact that one inspector resigned January 1st, another was ill from February 1 to the end of the season, we were not able to do the amount of testing and re-testing that should have been done. A total of 126,456 tests were made during the season 1934-35; of these birds 3,542 were found to be diseased. During the 1935-36 season a total of 153,551 tests were made; of these birds 4,737 were found to be infected. All of these reacting birds were removed from the flocks and sold for slaughter. This work is very popular and there is an increasing demand for it. A small fee is charged and the work is largely self-supporting.

The rapid, stained antigen test during the past five years has given satisfactory and gratifying results. The degree of infection found in the flocks each year is in direct proportion to the hatcheryman and flock owners' interest in controlling the disease, with the greater per cent of the burden being on the hatcheryman. With this test, when supported with strict sanitation and proper brooding of chicks on the part of the flock owner, Pullorum disease can be controlled almost 100 per cent, but without this coöperation, the testing will merely hold the infection to a lower per cent.

BANG'S DISEASE OR BOVINE INFECTIOUS ABORTION

Infectious Abortion of cattle, also referred to as Bovine Infectious Abortion, Bang's disease, contagious abortion, abortion disease, etc., is a transmissible disease, due to a specific organism or germ. This is a very versatile organism, in addition to causing most abortions in cows it causes many weak calves to be born, most of which die later. It is the cause of much breeding trouble, retention of after-birth, temporary and permanent sterility and great loss in milk production. It produces a disease of the sexual organs of a small percentage of bulls, certain lesions of the udder of infected cows and enlarged joints. It produces similar conditions in hogs, is sometimes associated with abortion in mares and poll evil and fistulous withers of horses and mules. It produces a diseased condition of chickens and characteristic lesions, resembling tuberculosis in guinea pigs. It has been found to cause undulant fever in man. An organism capable of causing as many widely different conditions seems to be well endowed with weapons for evil and it is not to be wondered at that it is causing such enormous losses. To insure its perpetuation it has found a way of reaching the udder of the infected cow and persisting there for years. One of the outstanding symptoms of this disease in cattle is the act of abortion or the premature expulsion of the

foetus, although this symptom is not always present. There are abortions due to other causes, but these are of far less importance than those caused by the abortion organism.

Work with this disease has been confined largely to testing under the Federal plan by which A.A.A. funds were made available for blood testing and paying indemnity on reacting animals. An amount not to exceed \$20.00 on grades and \$50.00 on registered animals is paid. This is based on the difference between the appraised value and the salvage, the owner receiving the amount received for the salvage. This plan was inaugurated as a cattle reduction program and not as a disease eradication program. Coöperation on this project is based on the State furnishing the laboratory facilities and doing the testing, the expense of obtaining samples and indemnity being paid from A.A.A. funds.

This work was started in September, 1934, and from that time to June 30, 1936, a total of 2,677 herds, containing 46,774 cattle, were tested, of this number 8,008 were found to be infected and were slaughtered. A total of \$212,374.36 was paid to the owners as indemnity. In addition to the above we have also made a large number of private tests and have continued to test State-owned herds and herds of charitable institutions. During the fiscal year ending June 30, 1935, we tested for Bang's disease in our laboratory 69,354 blood samples and for the fiscal year ending June 30, 1936, 98,120 blood samples.

RABIES

The general operation of the rabies law, Chapter 122, Public Laws of 1935, entitled, "An Act to Prevent Rabies, in the State of North Carolina," so far as the Department was concerned, was placed in this Division early in 1935.

During the 1935 season, 62 counties made some effort to comply with the law, but in only a small number of these were the greater part of the dogs vaccinated. We distributed 67,370 doses of rabies vaccine, which, with that purchased from other sources, I estimate that about 100,000 dogs were vaccinated during 1935. This represents probably less than 25% of the dog population of the State. During 1935, four quarantines were issued in accordance with Section 12 of the Act. During the 1936 season there were about 40 counties that made some effort to comply with the Act. Only a small number of these vaccinated near all of the dogs in the respective counties. We distributed 50,000 doses of vaccine and with that purchased from other sources I

estimate that there were 75,000 dogs vaccinated during 1936. One quarantine was issued in accordance with Section 12.

This Act is very lengthy, ambiguous and difficult of interpretation. It provides for divided authority and is very difficult of enforcement, as are all dog laws. This law was enacted with good intentions, for the prevention of rabies, a dreadful disease, but in my opinion it has and will fail to do this for the reason that it is unscientific, ambiguous and unworkable on so large a scale.

This Act has received much unfavorable comment throughout the country by men trained in the control of diseases and by publications devoted to such. We have received many unfavorable reports regarding vaccinating, which is what might be expected when we consider the type of inspectors that was appointed in many instances. I believe that such work should be done by a veterinarian in order to secure satisfactory results.

Prior to the passage of this Act the several County Boards of Health had authority, under the general law, to require the vaccination or quarantine of dogs, if the public health was endangered. There seems to be no good reason why the operation of this law should be placed in this Department, County Boards of Health could quarantine areas in which rabies exists much more satisfactorily than this office and would be in a better position to enforce such quarantines. They could likewise purchase vaccine for their inspectors much more satisfactorily than this office. We find it difficult if not impossible to secure sufficient vaccine at times with our system of purchasing, for a large number of counties.

In view of our experience with this law during the past two years, I recommend that this law be amended so as to place all supervision and enforcement under the County Boards of Health.

SHIPMENTS OF RELIEF CATTLE FROM THE DROUGHT AREA OF THE WEST AND MIDDLE WEST BY THE EMERGENCY RELIEF ADMINISTRATION

About the middle of June, 1934, we were advised by the Emergency Relief Administration that they wished to ship from the drought area of the West and Middle West, a large number of cattle to be pastured, fed and finally slaughtered for relief purposes. They further advised that these animals would be tested and inspected and a certificate issued to cover by the U. S. Bureau of Animal Industry. In a few days we were advised by the ERA that the Bureau of Animal Industry would be unable to test and inspect these cattle and asked that we waive the laws and regulations requiring the testing and inspecting of these

cattle. After going into this matter very thoroughly with the Commissioner of Agriculture, discussing it from every angle, we decided that we did not have the right to waive the laws and regulations covering and that these cattle should be tested and inspected before coming into the State.

While we were in sympathy with the unfortunate folks of the State who needed beef and the drought-stricken farmers of the West, we were immensely interested in the 200,000 or more cattle owners in this state who, through taxation and their moral support, had made it possible to eradicate many destructive animal diseases and who looked to us to protect their interest and this enormous investment. We were mindful of the progress made by North Carolina in the eradication of destructive animal diseases, this being the first State to completely eradicate tuberculosis from its cattle and one of the first to eliminate the destructive cattle tick.

In view of our decision the matter was referred to the Attorney-General, who issued an opinion in the form of a letter addressed to the Commissioner of Agriculture, setting forth that an emergency existed and authorizing these cattle to be shipped in to special quarantine pens to be tested under our supervision. During July, August and September, 1934, there were 100,921 cattle shipped in. Of this number, 4,821, upon inspection and test, were found to be affected with abortion or tuberculosis. After many weeks' delay these diseased cattle were finally slaughtered.

Slaughtering and canning of the cattle started in the early fall, but moved slowly. A total of 50,332 were finally slaughtered under the supervision of this office. Of this number 1,489 were condemned as unfit for food and 860 died in pens or were destroyed on account of emaciation or disease. In January, 1935, the remaining cattle were shipped out of the State to various slaughtering points for relief purposes. In the final check-up there were approximately 5,000 of these cattle unaccounted for. Many of these were later found to have died in the pastures, some were held by individuals, some were roaming at large in the swamps, but a large part of them are still unaccounted for. An inspection of some of these cattle in November indicated that they were affected with scabies, a serious skin disease of cattle, caused by a small parasite and somewhat similar to "itch" in man. A laboratory examination by the U. S. Bureau of Animal Industry confirmed the diagnosis. This disease had not previously existed in this State. Upon further investigation we found this disease to exist in a large number of these cattle in widely scattered sections of the State. We found 1,416 cattle infected with

scabies in 22 counties, there being 50 points where ERA and native cattle were affected. Among these were a number of cattle roaming at large in the swamps and woods of the eastern part of the State.

Owing to the highly contagious nature of cattle scabies and the widespread infection among these cattle, I anticipate that we will have a considerable amount of this disease among our native cattle for many years to come.

Quite a number of these ERA cattle were affected with Infectious Keratitis or pink-eye. This is a contagious disease affecting the eyes and is quite serious, often leading to complete blindness. Many cases of this has spread to native cattle. We quite naturally expect further trouble from this disease among native cattle.

This ERA cattle program was a costly experiment, the cost of same being greatly in excess of the value of the meat obtained. One cannot estimate the future cost by reason of the spread of previously unknown diseases in this State to our native cattle, but my guess is that it will be quite large. It is some satisfaction to know that we opposed the program and to some extent anticipated its ill-effects.

MISCELLANEOUS

We have had an increasing number of requests to investigate reports of outbreaks of disease. It has not been possible to take care of all of this on account of the greatly increased amount of laboratory and other work and an increase in travel funds. Many of these requests for assistance are for a purely personal service that could be taken care of at less expense and entirely satisfactorily by the local practicing veterinarian. This presents one of the most unpleasant problems with which this Division has to deal. Many livestock owners apparently believe that the State should supply them free and prompt veterinary service for all conditions. This, of course, is impossible and I believe undesirable. We have followed the policy of investigating so far as time and funds will permit, these reports that indicate that a serious contagious disease exists that, without our help, might spread and seriously affect the livestock industry when a large number of animals are affected and the cause cannot be determined.

No Anthrax, Sheep Scab, Black Leg or Glanders have been encountered during the period covered by this report, although we are constantly on the lookout for these diseases. We have

continued to look after the health of livestock on the twenty-two State-owned farms and have made considerable effort, with success, to prevent diseases among livestock.

Since the creation of the State Highway and Public Works Commission they have established more than 80 prison camps throughout the State, in addition to the prison farms already existing. Practically all of these camps have more or less farm land attached and on nearly all of them hogs are produced. Since all of these camps feed garbage from the prison kitchens, which is a prolific source of hog cholera, we believe that it is essential that these hogs be immunized against cholera. We have, therefore, undertaken a systematic plan of vaccinating all of the hogs at these camps and all of the pigs that are farrowed. During the period covered by this report we have made one or more visits to all of these camps for the purpose of vaccinating hogs and pigs. Most of these trips were made in connection with other work which we were doing.

FOOD AND OIL DIVISION

W. M. ALLEN

I beg to submit the following biennial report of the work of the Division of Food and Oil Inspection for the two years ending June 30, 1936:

The object of the work of the Division of Food and Oil Inspection is to protect the health, life and financial interest of the people of the State in the manufacture and purchase of foods and beverages and linseed oil.

The work is provided for and carried out under the following laws: Pure food, bleached flour, standard weight meal and flour, and sanitary bottling plant, bakery, ice cream plant, creamery, frozen custard, sherbet and cheese factory, and linseed oil inspection laws.

The enforcement of the food laws is to prevent the manufacture or sale of adulterated or misbranded foods and beverages. The food law makes it the duty of the Department of Agriculture to enforce the provisions of the act without providing any funds for the purpose, but the laws supplementing the food law carry inspection taxes and the enforcement of the food law depends upon the funds from the inspection taxes collected under these supplementary laws. The laws supplementing the food law provide that the food-producing places covered by the various inspection laws be operated in a clean and sanitary condition thus insuring that foods and beverages produced in these plants be clean and wholesome and not deleterious to health.

Funds provided for enforcing the laws under which this division operates are collected as inspection taxes under the following inspection laws:

Bleached flour	\$24,570.00
Bottling plants.....	3,600.00
Ice cream plants, creameries, etc.....	4,250.00
Bakeries	2,540.00
Linseed oil.....	3,965.74
Total	\$38,925.74

As foods shipped into the State are subject to the Federal Food Law, special surveillance has been maintained for the detection of adulteration, misbranding and misrepresentation of food products manufactured in the State, such as ice cream and other frozen products, and to products shipped into the State in bulk, properly labelled to meet the requirements of the Federal Food Law in interstate shipments, but, which, after being received in the State, are repacked and re-labelled, and some of

which, are offered for sale in violation of the State Food Law. In this class will be found such products as adulterated coffee, labelled and sold as coffee; distilled or spirit vinegar, labelled and sold as vinegar.

Samples of food products of various kinds have been obtained by the inspectors from all sections of the State and have been chemically, macroscopically or otherwise analyzed or examined to determine if such products meet the requirements of the pure food law and the regulations under the law.

The Department is frequently called on to make chemical analyses which are not provided for by any of the inspection laws under which it operates, nor are they provided for by any other State law. The Division does not attempt to do all of the work of this kind that is requested, but when it appears that an analysis would serve a worthwhile purpose and would help physicians and county officials in detecting and preventing crime, the work is usually done.

Official samples of foods, beverages and linseed oil and a number of other samples of various kinds, such as samples for poison sent in by physicians and county officials, have been analyzed as follows:

Food for adulteration and misbranding.....	3,776
Beer and ale for alcohol.....	69
Wine and whiskey for alcohol.....	32
Water for mineral content.....	49
Beverages and foods for suspected poison.....	92
Contents of human stomachs for poison.....	6
Contents of animal stomachs for poison.....	71
Linseed oil.....	158
Miscellaneous	18
Silk dress and pants for blood stains.....	2
Apples for spray residue.....	7
Total.....	4,280

Careful sanitary inspections of the food and beverage-producing plants are made by the sanitary food inspectors. They secure samples of food and food products throughout the State for chemical and other examinations for adulteration. They examine packages of food products to see if they are properly labelled.

Since the sanitary food laws have been in force and effect the plants covered by these laws have made great improvement in the sanitary condition under which they operate. While practically all of the larger plants and most of the smaller ones are so operated that they are very satisfactory, some of the smaller plants are owned by a less intelligent class of people who do not

understand the importance of sanitation and they are inclined to feel that the requirements of the law are unjust interference with their business. The inspectors have succeeded marvelously well in explaining to this class of people the danger to the health of their customers in producing food products in dirty, filthy plants. The inspectors also point out to them the financial advantages to be derived by keeping their places clean and attractive.

Inspections have been made as follows:

	Number of Plants	Number of Inspections
Bakeries	144	1,147
Bottling plants.....	199	1,460
Ice cream plants, creameries, etc.....	229	1,721
Total.....	572	4,328

The oleomargarine work requires a great deal of the inspectors' time, as the law requires all parties handling oleomargarine to have a license and all places, such as hotels, restaurants and boarding houses to have placards with the legend, "Oleomargarine Served Here" displayed in a conspicuous place in each dining room. The inspectors have found more than twice as many places not handling or serving oleomargarine as handle or serve it.

Number of inspections of places handling or serving oleomargarine.....	2,680
Number of inspections of places not handling or serving oleomargarine	6,048
Total number of inspections.....	8,728

Very little, if any, oleomargarine is being shipped into the State that contains foreign fats.

LINSEED OIL

Samples of linseed oil analyzed during the past two years show practically no adulterated or misbranded linseed oil or substitutes for linseed oil has been offered for sale in the State.

DAIRY DIVISION

A. H. KERR

The following biennial report for 1934-36 is respectfully submitted:

The Dairy Division has made 1,687 inspections of plants, cream stations, milk routes and other dairy establishments. There have been made 7,903 Babcock tests for butterfat on the milk and cream delivered at the plants by producers. In all cases where cream is delivered it has been inspected for quality, flavor and general condition. This inspection has covered 3,500 tins or containers, some of which contained the cream of several producers and had to be inspected as a composite batch. On this cream, which we call the cream route delivery, there were 843 Babcock tests made for butterfat, which were used as a check against the individual test and sample taken by the route hauler or cream station operator. The whole milk samples that are taken at the plant are tested by the licensed testers at the several plants. There are now 134 people licensed to weigh, sample and test milk and other dairy products in the plants over the State.

There is one conditions that has been observed in milk delivered at the milk plants that I especially desire to call attention to, that is the delivering of a partly-filled can of morning's milk that is not required to be cooled, which shows much evidence of churning and breaking of the butterfat contained therein. When this milk is poured up, the churned butterfat sticks to the can and thereby injures the test to whatever extent this fat adheres to the vessel. This condition does not appear seemingly in milk that is cooled below 60 degrees where the can is full. These facts have been called to the attention of each producer as the occasion demands.

There have been 134 licenses issued to testers, weighers and samplers. Of this number, 11 were for sampling and weighing only as cream route haulers. The Dairy Association of Secretaries and representatives of the various localities have been visited and the condition of tests discussed with them. Many farmers and producers have observed the testing of their milk and weighing and sampling of same. The examination given these men that are licensed is first an oral quiz followed by the general discussion of the specific facts relating to butter.

The cream and butter improvement campaign, which resulted in the passage by the Board of Agriculture of regulations prescribing the requirements of legal cream, has been very effective and 3,500 containers of cream of various sizes have been examined for quality. At each plant inspection the filter cloths are

examined to see the result of cleanliness that has been used in producing the cream. There appears to be much improvement in this condition. One outstanding fact, I feel, should be brought to the attention of everybody with regard to flavor and taste of highly quality butter. Foods having an annual value in the United States of nearly \$2,000,000,000 are subject to spoilage by rancidity. The loss, due to this form of spoilage, often amounts to as much as 5 per cent of the total value of the product. Among the foods apt to become rancid and unfit for human consumption are edible oils and oil-bearing foods, such as butter, lard, potato chips, peanut butter, nuts, coffee, dried-milk products, corn meal, whole-wheat flour, certain breakfast foods, biscuits and crackers. This condition is caused by direct sunlight.

As a result of the butter improvement campaign the following coöperative activity was carried out by the Dairy Division in joint action with the United States Food and Drug Administration of the Atlanta Station:

In inspecting 22 plants producing butter and dairy products in North Carolina in 17 of these plants, cream was inspected as delivered in the individual producer's can. It was found in five plants that cream unfit for use in butter making was being received. There were inspected 1,297 cans of cream, 1,281 cans of which were passed as wholesome edible products, 16 were condemned as unfit for food and not allowed to be used for butter making. One of the great difficulties in handling cream is yeast and mold, for which 13 cans of cream were condemned, the indications being that this cream had been held as much as ten days in some cases. In two incidents insects, such as flies, gnats and cockroaches, were found in cream and the same was condemned.

After returning the cans of cream to the individuals producing and delivering them, we have had far better coöperation than at any time previous. When the cans of cream were returned to the producer, a bulletin was given to the route hauler, along with a printed regulation for the production of legal cream. The route haulers and inspectors at the several creameries have been instructed as to methods of handling good quality cream and are now condemning and rejecting unfit, moldy, putrid and polluted cream. There seems to be a whole-hearted coöperation among all these men and the producers themselves are beginning to brag about what nice cream they are delivering. Every butter-maker is now of the opinion that the improvement is wonderful and yet we can still improve it. At the plant the filter pads through which the cream is filtered, have been examined at every plant in question. These filter cloths are now practically free of debris and

filth, showing very little except curds and occasional particles of foreign matter. It has been urged upon all plants and products to steam out, scrub clean and sterilize all containers before putting milk or cream in them.

Butter: At the 22 plants inspected, 41 samples of butter have been taken, 20 of these samples were taken at the plant, 8 of which were of poor quality, due to the following reasons: Five of them were slightly deficient in percentage of butterfat 14 showed evidence of mold in a slight manner to an extreme degree, 2 showed excessive amount of debris and 1 was designated as rancid or spoilt.

The result above expressed clearly indicate that laboratory methods of examination of cream and butter in North Carolina are very necessary. An effort has been made to start this procedure and samples are now being taken for the examination of butter for mold, foreign matter and spoiled condition. Such efforts as have already been made have brought about a very marked improvement in the quality of cream especially, and, therefore, the same improvement is seen in the butter quality. Herewith is attached a copy of analysis and findings of the Atlanta Food and Drug Laboratory, most of which was completed in 1935, but covers much activity in 1936.

The testing equipment, such as scales, weights and bottles, are examined to see that they conform to specifications, graduations and all other details. One dozen weights have been confiscated, due to the deficiency and are now in the possession of the Weights and Measures Department and the Dairy Division. The entire State has been covered by the Chief of the Dairy Division and the Superintendent of the Weights and Measures Division in checking all scales of the dairy plants. This checking now is in the hands of the Weights and Measures Inspectors and is carried on regularly by them. It is desired to express appreciation for the great coöperation that has been shown by the Weights and Measures Division.

There have been collected \$1,225 in taxes from the wholesale dealers of oleomargarine. The retail dealers in oleomargarine have been licensed and inspected by the Food Inspectors of the Chemistry Department, coöperating with the Dairy Division. I desire to make special mention of the coöperative work between the Chemistry Department and the Dairy Division.

The Dairy Division, Department of Agriculture, has been responsible for the Dairy Products Exhibit at the State Fair during this period. A different product has been stressed each year with emphasis on the food value of dairy products generally

being used. This exhibit has attracted a great deal of attention and apparently been of considerable value in the Dairy Industry and benefit to the people of North Carolina.

There appears to be a very large movement of milk and dairy products into North Carolina from Virginia and Tennessee and a considerable amount of movement from North Carolina to South Carolina and Georgia. This condition makes it rather important to keep in touch with the Federal Food and Drug Administration, which, we believe, has been done very effectively.

There has been a marked demand for the services of the Dairy Division by the producer-distributor, who sells his own milk in about 307 communities in North Carolina. In these communities there are 926 dairymen who have been helped in a very small way, and it appears that they would be very much pleased with additional assistance from the Department of Agriculture.

STATISTICAL DIVISION

FRANK PARKER

WM. H. RHODES

The past four years (1933-1936) have been, perhaps, the most important and taxing in the history of the Crop estimates work, which was begun as the *first* work of the United States Department of Agriculture. It is indeed fortunate that the North Carolina Department of Agriculture entered into a coöperative agreement in the crop estimates field in 1919. By so doing, a well-developed and established information service existed when the farm relief programs were begun in 1933. North Carolina was, therefore, READY for such an ECONOMIC movement, and to an extent greater than any other Southern State and equal to any in the country.

The State's yearly farm census survey, developed through the county commissioners, has justified itself in usefulness and reliability. The United States census of 1919, 1924, 1929 and especially 1934 have proven the reliability of these State surveys, which are completed from one to three years before the United States results are available. These surveys have been especially useful to county farm agents, agricultural teachers, AAA committeemen, agricultural school advisory boards, newspapers, agricultural specialists, manufacturers of farmers' supplies, railroads (for transporting perishable products), county officials (county bonds, advertising county, etc.), the United States Bureaus of Agricultural Economics and Census, research workers of this and other States, and progressive farmers themselves.

The voluntary crop reporting aids, who receive no pay, now number several thousand and are divided into many classifications. About 150 different regular and special reports are secured yearly. More than 500,000 envelopes have been USED annually. In July, 1936, an order for 1,050,000 envelopes was placed for 1937. Stationery and envelopes are furnished from Washington by the carloads. Special speed machines are required and are in use for addressing, folding circular letters, sealing and even in opening the mail to this office.

Crop meter *measurements* are made in June and August, covering about 3,600 miles of the farming counties of North Carolina. Field investigations and cotton boll COUNTS at five-mile intervals are made monthly during the summer and fall.

Special reports on threshermen's records, tobacco warehouse sales and similar production reports are required by State Acts. Rural Mail Carriers coöperate in June, September and December

in securing surveys on acreages and livestock on farms along their routes.

During the past two years, the field of work has been greater than ever before. During 1936 special WPA clerks have been busy with much needed educational and follow-up services not otherwise possible. As a result, there has been a noticeable improvement in the attitude toward the crop reporting services and an increase in cooperation with this office by county officials and agricultural leaders.

There has always been a greater demand for the information than there were facilities for supplying farm statistical facts. The last few years have proven to be an era for the development and increasing use of farm economics or basic information for better farm planning and of planting and marketing.

After a talk before the State Association of County Commissioners at Asheville in August, 1936, the comments of these county officials distinctly indicated a healthy condition in their relationship with this service, and especially in regard to their attitude toward the crop report work. This was especially gratifying in view of a resolution by that body two years ago recommending to the Legislature that their farm census work be abolished.

The *Farm Forecaster* publication is accepted as the official COUNTY FARM FACTS publication of the State. Requests for all manner of farm information now comes to the Crop Reporting Service office. There are usually about 15,000 *Forecasters* printed per issue. A *Farm Forecaster* special clerk should be provided to prepare the printer's copy, which otherwise can be prepared only when opportunity is available. Pressing work has delayed the 1936 annual issue. The needs and demands for these publications justify additional aid. Customary delays in its preparation and printing, due to insufficient help, should be avoided.

SUMMARY OF WORK, EXPENDITURES, ETC.

	Number	Annual Salaries
Regular State employees.....	8	\$10,836.00
Special census Clerical (three months).....	14	2,288.26
Regular Federal employees.....	4	12,246.24
	1935-36	1936-37
State allotment (Total).....	\$ 14,335.00	\$ 14,765.00
State also furnishes office space, janitor service, water, lights, fuel, telephone service and some equipment.		

Federal Allotment:

Total salaries and travel 1935-36.....	\$ 12,746.24
United States Department of Agriculture also supplies most office furniture (automobile, \$427.80), postage for mail, paper and envelope supplies, \$25,000.00; equipment annually, \$525.00.	

REPORTS DEVELOPED BY THE DIVISION

Farm Census Report—1935, Covering 250,209 Farms:

Regular reports developed annually.....	12
Cotton reports.....	7

Special Reports:

Ginners.....	6
Fruit.....	4
Boll counts.....	5
Mill and elevator.....	4
Legume.....	3
Special yields.....	2
Cost of crop production.....	1
Special winter wheat and rye.....	1
Buckwheat, clover and timothy.....	3
Pecans.....	2
Special drought reports (weekly).....	12
Livestock.....	2
Poultry.....	1
Price reports.....	24
Lespedeza.....	1
Tobacco.....	3
Crop utilization.....	2
Peanuts.....	1
Potatoes.....	2
Tobacco warehouse sales report.....	7
Threshermen reports.....	2,500
March intentions to plant.....	1
June acreage report.....	1
September acreage report.....	1
Livestock.....	1
June and December pig and livestock survey.....	2

Publications:

FARM FORECASTER.

Monthly mimeographed crop releases on all regular and special reports listed above.

Field Travel:

State.....	11,023 miles
Federal.....	12,434 miles

Field travel for the purpose of crop investigation, cotton boll counts, administration of the State Farm Census and Threshing Laws and emergency projects.

Mail Handled:

Outgoing—	1935-36	1934-35
Schedules.....	181,790	165,896
Reports.....	92,658	61,581
Letters.....	117,080	22,778
Farm Forecasters.....	17,900	21,600
Rural carriers' inquiries.....	61,000	61,600
Total.....	470,428	333,455
Incoming—		
Letters.....	8,635	8,831
Schedules.....	56,314	38,903

CREDIT UNIONS

HARRIET M. BERRY

During the past biennium the 1935 Legislature amended the Act establishing this division so as to change the name of each organization operating thereunder from "Savings and Loan Association" to "Credit Union." Throughout the period the superintendent has promoted, organized, supervised and audited credit unions in the State.

With improving economic conditions, credit unions have increased steadily in numbers, resources and membership. Great impetus has been given to the movement by the nation-wide publicity given the reports of the Federal Government and many research organizations, which recognize that the credit union points the way to economic betterment for groups of working men and women, whether on salary or wages. It supplies its members with coöperative credit by furnishing them the machinery to pool their accumulated savings, invest the money in loans to members of the group for provident or productive purposes at a reasonable rate of interest, and teaches them through experience that the management of money is not a complicated business, but chiefly calls for the exercise of that old-fashioned virtue—honesty. Practically every loan made by a credit union either results in relieving anxiety during time of sorrow or need, or in greatly improving the morale of the borrower and permanently improving his financial position.

Forty-one states of the Union and the Federal government now have laws under which credit unions may operate. North Carolina, by enacting its original law in 1915, was one of the first to extend the benefits of such a coöperative credit bank to its people and it is proud of the fact that under its law people are able to create normal credit facilities by which the average worker in industry and the small farmer may obtain small loans at 6%, who formerly was forced in time of economic distress to resort to the loan shark with his shocking interest charges which frequently ran as high as 500%. The Federal Credit Unions and those operating under the laws of several other states make loans on a basis of 12%. Our people now recognize that the money in their pay envelope is not the all important thing — but the purchasing power of that money—and they are in increasing number utilizing the credit union to combat the usurious interest rates and excessive installment overcharges, which have hitherto decreased their buying power. Enlarging the number

of credit unions among our wage earners will result in raising their standard of living and stimulate industrial prosperity by automatically increasing the market for goods they consume.

We now have credit unions in the following counties: Alalamance (1); Avery (1); Beaufort (1); Buncombe (6); Burke (1); Cherokee (1); Clay (1); Catawba (1); Craven (2); Cumberland (1); Durham (5); Edgecombe (3); Forsyth (6); Guilford (6); Iredell (1); Haywood (2); Harnett (1); Lenoir (2); Mecklenburg (9); New Hanover (1); Nash (4); Rockingham (1); Richmond (3); Rowan (2); Scotland (1); Vance (1); Wake (7); and Wilson (1).

Number of Credit Unions in the State.....	72
Number of members.....	6,245
Number of depositors.....	1,360
Number of borrowers.....	10,904
Amount invested in shares.....\$	285,853
Amount invested in deposits.....	161,910
Total resources	505,604
Total loans made during the biennium.....	1,117,724.45
Total interest charges on loans.....	53,813.21

The coming biennium will witness a tremendous increase of credit unions in the State provided the division is given a more liberal allowance for organization purposes and the other requirements of the work. In order that the superintendent may have sufficient time to devote to organizing new credit unions, the division should be provided with a full time secretary and an auditor.

STATE MUSEUM

H. H. BRIMLEY

With increased allotments for operating expenses, we have been able to do more and better work during the period than was possible in the preceding biennium, and I trust that the further increases asked in our budget estimates for the coming two years may be approved so that we may continue to increase the Museum's sphere of usefulness.

The accessions to our collections have been gratifying both in number and quality, the following list showing some of the more noticeable items:

Invertebrates: A collection of sea shells and other marine invertebrates collected by Miss Collie in the Beaufort region. A great land crab, captured alive in Raleigh but probably originating in Florida.

Fishes: A forty-seven pound cabio, donated by Mr. E. B. Keith, of Raleigh; a thirty-five pound cero, secured by Miss Collie at Beaufort last summer, who also collected for the museum a five-foot blue shark, a four-foot bonnet-head shark, lizard-fish, bat-fish as well as specimens of six other species.

A thirty-five pound amberjack, from the Gulf Stream off Cape Lookout, was another addition, but our largest and rarest specimen of fish was a thirteen and a half foot basking shark, from Southport. This fish weighed about 600 pounds and it was the first record of this species south of New Jersey. Flying-fish and sea-horse also come under this classification.

Reptiles: A banded rattlesnake in the black phase of coloration. A series of diamond-back terrapin, including specimens very small and up to full adult size, was donated by Dr. H. F. Prytherch, Director of the U. S. Marine Biological Laboratory, Beaufort, N. C. A number of specimens of lizards, snakes and terrapin of various kinds have also been added.

Birds: Blue-winged teal, young barred owls, thirteen specimens of birds of nine species collected by Miss Collie, at Beaufort, and the following species that are very rare in this State: Blue goose—two specimens, glaucous gull, European widgeon and sooty shearwater.

Of birds' eggs, the following have been secured: Brown pelican, royal tern, Cabot's tern, least tern, American woodcock and whip-poor-will. Except for the last two, all of the above eggs were donated by Mr. George Lay, of Raleigh.

Mammals: Wild cat, killed by an automobile; ferret, harbor seal, donated by Doctor Prytherch, and the skull and part of the skeleton of an eighteen foot false killer whale, the last two species being very rare in North Carolina.

The false killer, found in an injured condition by Mr. E. B. Kugler, of Raleigh, near Hatteras Inlet, was killed by Mr. Kugler on July 5, 1925. Being too heavy to be hauled up on the beach, the next high tide carried it out to sea. Later, the body was again washed ashore, this time high enough to stay there. The carcass decomposed and disintegrated. Some time later on, after learning the facts, I made contact with Mr. C. W. Burrus, of Hatteras, who most kindly secured all the bones he could find and sent them to the museum without cost to us.

From all the information I have been able to gather, this would seem to be the first specimen of false killer whale ever recorded in the flesh from any part of the coast-line of the United States.

The skin and head of a large buck albino deer is another interesting accession. The skin, however, was not in good condition for mounting, which fact, together with the absence of all leg-bones and measurements, made it inadvisable to make the attempt. But the head has been mounted and the skin tanned, for exhibition.

Geology: The following matter is submitted by Mr. Davis on the work of his Department:

"Due to financial limitations there has been very little field collecting of minerals, though a number of mineral and other geological specimens have been contributed by those interested in the museum.

"Perhaps our most notable meteorite was seen to pass over the State on December 1, 1934; two pieces of it landed near Farmville and were secured by the Museum, the larger through the good offices of Mr. and Mrs. A. C. Monk. The smallest of these was exchanged with the U. S. National Museum for one half of the 'Graves,' Moore County, meteorite plus a material section of the Forsyth County meteorite. This gives the Museum one of the best State collections.

"Mineral specimens sent in by citizens for analysis and identification have continued to come in at the usual rate, one per day. Minerals and rocks for exhibit have also had the required attention in the chemical laboratory.

"Exhibit cases have been renovated and the exhibits cleaned, new labels provided, as other duties allowed. One case of petri-

fied wood is new and an exhibit illustrating the production of aluminum at Badin is being prepared.

"In archeology, 125 specimens added—Indian artifacts, and old ones brought up to date."

In the summer of 1934, Mr. Davis and I worked a marl deposit near Pollocksville, in Jones County, following the discovery of a mastodon bone at the place. While disappointing as to any great amount of mastodon material, we found fossil specimens of scientific interest, as follows: Teeth from six species of shark, bones of two species of turtles, a few mastodon bones, small bones of a whale of some kind, and something in the crocodile line.

From New Hanover, Wilson and Halifax Counties, specimens of fossil whale bones and shark's teeth have been received.

Archeology: During the past summer, a village site was partly excavated near Asheboro by the State Archeological Society. Material of value was secured, in which the Museum will share by reason of a contribution of \$25 together with the active participation of Mr. Davis in the work of excavation.

For the reason that this important but long neglected line of work has little prospect of being continued unless the Museum takes part in its continuance, our budget requests show an increase of \$300 under the heading "Extra Salaries and Wages," with the view to using the greater part of the increase during each of the summers of 1937 and 1938 for the purpose of excavating one mound each year.

Agricultural History: We are steadily—if slowly—adding to our collection of objects illustrating this subject. The most notable item added during the period under discussion is a large and heavy home-made wooden corn sheller. Besides this, some old plows and guns have been added.

Although the notes that immediately follow refer to a time more recent than the period covered by this report, I feel that it is not amiss to state that Mr. W. M. Sanders, of Smithfield, has recently promised the Museum the large and varied collection of items relating to Agricultural History made by his late father and later added to by his mother, also deceased. This collection has been known to me for many years and, during the lifetime of Mr. W. M. Sanders, Sr., he often called at my office to discuss it, always showing a preference for the State Museum as the collection's final abiding place.

Our model of a whale shark tail and part of body is now on exhibition. Although not a complete specimen, the parts shown

indicate the enormous size of the fish, which was larger than any other specimen of this species on exhibition in any other Museum in either the United States or in Europe, so far as I have been able to ascertain. The fish from which the parts we have came was estimated to be thirty-five feet in length with a weight of more than five tons. The tail itself measured nine feet, ten inches from tip to tip.

Our third specimen of harbor seal, referred to earlier in this report, will be added to the group of two that we already had. The background for this group has now been painted and it should not now be long before the group is completed and opened for exhibition.

Attendance: Our attendance records seem now to indicate that the year's total will be about twelve per cent over that of last year, a very creditable showing. Our last six months average was about 17,000 per month, which should assure a total for the year of well over 200,000.

Keeping the Museum open on all Saturday afternoons, and on all State holidays, with the exception of one or two days at Christmas, allows the public free access to the Museum on 311 or 312 full days per year, from nine to five o'clock. We do not observe daylight saving time in summer for the reason that the winter hours seem to better suit the convenience of our visitors.

During the school season, the members of the Raleigh Chapter of the Junior League have continued their docent service for the Museum by conducting classes of school children through the exhibition halls. Mr. Davis and I have prepared guide information in written form for each of our halls, which have been distributed among the members of the League assigned to this work.

I feel that this organization of young women is making a well worth-while contribution in their efforts towards informing the children on what the Museum has to show, as the best of labels must necessarily fall short of conveying anything more than a few salient facts. Experience has shown that a too-long, or too-descriptive label is likely to be left unread.

It is estimated that at least 400 classes of school children visit the Museum annually.

In 1930, a publication entitled, "North American Big Game Records" was issued, in which only one record appeared from any southern State, that being a white-tailed deer, from Texas. Feeling sure that North Carolina produced sets of deer antlers worthy of inclusion in a future issue of this publication, I have

been measuring, photographing and securing data on a number of good heads of our native deer. I have sent eight such records to the proper authorities in New York in the hope that some of them, at least, may be deemed good enough for inclusion in the new edition of the work that is to be published some time in the near future.

The Director of the Museum has attended ten out of the last eleven annual meetings of the American Association of Museums, the 1933 meeting having to be passed up by reason of my then-recent contact with a T model Ford. Mr. Davis has also attended a number of these meetings and I feel that the practice should be followed annually as one cannot fail to be highly benefited by such attendance.

It is not so much listening to the papers that are read that counts but, rather, the personal contacts one has with museum workers from all over the country, together with visits to museums and their work-rooms and laboratories in the place where the meeting is held.

The foregoing brings up the question of the allotment for travelling expenses. Our budget requests include an increase under this head. We have found from sad experience that too low a limit in this bracket has prevented members of the Museum force from making trips to trace information on what might prove to be valuable finds. We have frequently had to turn down opportunities to add material of value to our collections by reason of a shortage in "Travel" funds.

The routine and general office work of this Division has been carried on as satisfactorily as could be expected under the uncertainty that has prevailed in the matter of office help. This work is very varied in character. There is always something demanding attention among the exhibits already on display, as a specimen in a museum show-case is by no means necessarily a permanent item. Dust, deterioration, color fading, rearrangement due to the addition of new specimens, museum insect pests (the last applying mainly to zoological specimens) are always active in making work for the museum official.

In the securing and preparing new specimens, one never knows in advance when a small bird, reptile or fish, or something really gigantic, may demand immediate attention. News of a new meteoric fall may call for a sudden and quick trip to get ahead of representatives of other museums hurrying to secure the specimen.

Our correspondence covers a wide field and one can never tell what peculiar request the next mail may bring in.

Museum Rooms: Last year, all the walls and ceilings in the Museum, with the exception of one exhibition hall and our work-rooms and storage space, were repainted. This work was badly needed and it resulted in an almost unbelievable improvement in the appearance of the rooms. This was a W.P.A. job.

During the present year, some dry-rotted sills and floors were repaired, and the whole floor of the main entrance hall, a room approximately fifty feet square, was refloored in marble. The floor in this room had been in bad condition from dry-rot for some time, but we now have one that is attractive in appearance—and should be permanent.

A long-felt want was also filled by the installation of a bubbling drinking fountain just inside the main entrance, this item, together with the marble floor, having been provided for by a direct appropriation by the Legislature of 1935.

Miss Roxie Collie, who holds a Bachelor of Science degree from Meredith College, is still working part-time with us without regular salary, for the experience. During the past two summers, she has spent a part of the time at the U. S. Marine Biological Laboratory, at Beaufort, during which time she has collected a number of interesting specimens for the Museum. During the remainder of the year she has been working partly for us, and we, in turn, refer all inquiries relating to custom taxidermy work over to her. She has developed into a competent taxidermist and has mounted a large number of deer heads and other specimens for sportsmen desiring to save their trophies.

The Museum has suffered quite a lot from petty thieving, the thieves at times even breaking the weak locks with which a number of our cases were originally equipped. We have already replaced twenty-four of these with a much better and stronger lock, and we have thirty-six more of the better type already purchased, with which to replace the remainder. This thieving is almost entirely confined to the halls of the second floor.

I hope that some arrangement can be made to secure that old wooden cotton screw on the prison farm. Rare as this appliance now is, I feel that this one should be secured while still available.

The operating cost of the Museum for the biennium amounts to about five cents per visitor. I find that other museums for which I have figures have an operating cost of from fifteen to sixty cents per visitor. This comparison would seem to show that we do not operate on an extravagant scale.

The following papers by members of the Museum force have been published during the period: One on meteorites by Harry T. Davis, and one each on the whale shark and the basking shark by the writer.

In this—possibly my last—report to you, I desire to express to you my sincere appreciation of the helpful interest you have always shown in all matters relating to the Museum. Some of our best work could not have been carried out without that interest and support.

WEIGHTS AND MEASURES

C. D. BAUCOM

I am pleased to submit biennial report covering activities of the Weights and Measures Division of this Department for the period ending June 30, 1936.

Our record of inspections is as follows:

Objects Inspected	Approved	Condemned	Confiscated	Released	Total
Gasoline Pumps.....	9,514	3,137	.....	2,039	14,690
Oil Pumps.....	5,167	713	.....	402	6,282
Kerosene Oil Pumps.....	3,165	580	.....	337	4,082
Scales.....	12,632	2,316	311	1,188	16,447
Weights.....	10,872	.....	1,534	.....	12,406
Dry Measures.....	2,577	.....	790	.....	3,367
Liquid Measures.....	13,564	.....	1,974	.....	15,538
Packages.....	58,918	24,981	.....	.....	83,899
Deliveries, Coal, Ice, etc....	1,183	161	.....	.....	1,344
	117,592	31,888	4,609	3,966	158,055

In addition we have successfully prosecuted 68 defendants. During this period the traffic in handling motor fuels in transport trucks developed almost over night and this Division has been called on to calibrate and seal 138 such tank trucks. The last session of the General Assembly increased our appropriation so as to pay two full-time inspectors and their work speaks for itself in the record.

Recognizing the inadequacy of the appropriation for the Weights and Measures work caused some of our county and city governments to appoint local inspectors and I am happy to say that their coöperation and interest in the work have been most gratifying. While our general routine work is testing and approving, or condemning, as the case may be, of the various weighing and measuring devices found in use in the State, we find that the greater part of the violations of the Weights and Measures Act is due to the misuse of the weighing or measuring devices through carelessness or wilful intent to defraud the consumer. Our activity in coping with this situation is revealed in the report showing the number of packages weighed. During this period we have endeavored to distribute our work over as much of the State as possible, concentrating possibly at the greater centers of population.

As previously reported, it is estimated that there are 36,000 gasoline pumps in this State and around 60,000 scales, to say nothing of the various and sundry other types of weighing and measuring devices in use. An increase in appropriation reflected in personnel would prove to be of great benefit to the mass of people of this State is my humble opinion.

FINANCIAL STATEMENT

STATEMENT OF DISBURSEMENTS

JULY 1, 1934—JUNE 30, 1936

<i>Administration</i>	<i>1935-36</i>	<i>1934-35</i>
Board.....	\$ 1,773.70	\$ 1,114.66
Salary Commissioner.....	4,500.00	3,825.00
Salaries Staff.....	10,260.00	8,241.25
Supplies.....	726.87	764.34
Tags.....	7,273.10	7,088.64
Postage.....	460.00	400.00
Telephone and Telegraph.....	272.77	226.94
Express.....	59.51	86.08
Travel.....	873.64	932.26
Forms.....	283.15	285.46
Bulletins.....	2,645.25	3,325.83
Repairs.....	22.83	13.25
General.....	137.03	64.79
Equipment.....	219.28	2,330.67
Reserve.....	166.80	.....
	\$ 29,673.93	\$ 28,699.17
 <i>Inspection</i>		
Salaries.....	\$ 9,870.75	\$ 6,920.93
Supplies.....	77.29	61.74
Postage.....	.....	10.00
Express.....	348.73	346.86
Travel.....	16,013.96	13,938.29
Printing.....	52.39	2.98
	\$ 26,363.12	\$ 21,280.80
 <i>Markets</i>		
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	5,560.00	4,492.50
Salaries Extra.....	137.40	243.81
Supplies.....	199.47	190.77
Postage.....	200.00	200.00
Telephone and Telegraph.....	91.64	144.82
Express.....	2.67	.50
Travel.....	2,138.56	2,459.84
Printing.....	30.00	26.67
Repairs.....	14.50	.....
Per Diem and Fees.....	613.28	482.94
Subscriptions.....	100.00	50.00
Equipment.....	68.19	75.00
	\$ 12,155.71	\$ 10,616.85
 <i>Savings and Loan</i>		
Salary Superintendent.....	\$ 2,100.00	\$ 1,740.00
Travel.....	374.49	527.12
Forms.....	107.43	.....
	\$ 2,581.92	\$ 2,267.12

<i>Analytical</i>	<i>1935-36</i>	<i>1934-35</i>
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	16,260.00	13,110.00
Supplies—Office.....	190.88	118.26
Supplies—Scientific.....	1,041.19	547.96
Postage.....	250.00	350.00
Telephone and Telegraph.....	60.35	60.00
Express.....	68.17	69.87
Printing.....	169.28	174.57
Repairs.....	77.87	42.77
Equipment.....	529.44	497.43
Travel.....	62.60	.....
	\$ 21,709.78	\$ 17,220.86
<i>Entomology</i>		
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	5,687.10	5,144.00
Office Supplies.....	63.10	57.24
Scientific Supplies.....	106.49	59.69
Postage.....	260.00	330.00
Telephone and Telegraph.....	113.06	89.44
Express.....	.97	5.75
Travel.....	2,813.10	2,676.28
Printing.....	24.66	78.41
Subscriptions.....	149.95	49.22
Equipment.....	16.49	240.93
	\$ 12,234.92	\$ 10,980.96
<i>Botany</i>		
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	6,240.00	4,490.25
Office Supplies.....	48.66	45.66
Scientific Supplies.....	78.58	31.00
Postage.....	200.00	360.00
Telephone and Telegraph.....	64.81	62.21
Express.....	6.51	13.82
Travel.....	181.35	45.06
Printing.....	250.00	174.90
Repairs.....	12.43	7.12
Equipment.....	195.45	320.55
	\$ 10,277.79	\$ 7,800.57
<i>Pure Food</i>		
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	12,399.97	6,250.00
Office Supplies.....	123.75	76.31
Scientific Supplies.....	496.05	179.83
Postage.....	150.00	155.00
Telephone and Telegraph.....	64.49	63.79
Express.....	6.45	4.85
Travel.....	111.14	60.44
Printing.....	100.00	68.65
Repairs.....	19.20	20.00
Laundry.....	21.33	3.27
Office Equipment.....	5.05	266.97
Scientific Equipment.....	115.60	.....
	\$ 16,613.03	\$ 9,399.11

Crop Statistics

	1935-36	1934-35
Salary Chief.....	\$ 1,920.00	\$ 1,560.00
Salaries Staff.....	8,245.57	6,615.00
Salaries Census.....	2,559.56	2,687.26
Supplies.....	149.37	78.75
Postage.....	30.00	23.34
Telephone and Telegraph.....	77.04	94.87
Travel.....	815.98	218.40
Printing.....	1,329.56	1,245.01
Repairs.....	29.74	23.00
Subscriptions.....	10.00	10.00
Equipment.....	55.00	49.04
	\$ 15,221.82	\$ 12,604.67

Museum

Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	2,810.00	1,930.00
Salaries Extra.....	185.00	184.96
Supplies.....	199.21	20.00
Postage.....	30.00	65.00
Telephone and Telegraph.....	67.89	9.63
Express.....	22.07	.....
Travel.....	150.00	12.00
Printing.....	46.50	194.16
Subscriptions.....	22.00	150.00
Equipment.....	302.80	.....
	\$ 6,835.47	\$ 4,815.75

Serum

Supplies.....	\$ 349.79	\$ 344.18
Postage, Express.....	873.43	1,071.12
General.....	87.31	6.19
Serum.....	14,000.00	14,584.35
	\$ 15,310.53	\$ 16,005.84

Veterinary

Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	8,940.75	6,776.71
Supplies.....	124.16	93.85
Postage.....	.....	50.00
Telephone and Telegraph.....	119.87	129.70
Express.....	13.13	4.53
Travel.....	6,371.60	5,805.58
Printing.....	12.82	23.70
Repairs.....	.65	12.04
General.....	40.88	42.03
Equipment.....	294.83	92.66
	\$ 18,918.69	\$ 15,280.80

<i>Test Farms</i>	<i>1935-36</i>	<i>1934-35</i>
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Salaries Staff.....	43,596.69	34,050.17
Supplies.....	13,537.95	15,557.88
Postage, Express, Tel. and Tel.....	1,206.84	1,618.76
Travel.....	3,104.30	3,163.24
Printing.....	32.31	325.00
Heat, Light, Water, Power.....	3,944.77	3,642.08
Equipment.....	8,355.38	3,378.00
Additions and Betterments.....	18,108.43	4,191.00
Contingent.....	2,035.62	2,026.67
	\$ 96,922.29	\$ 70,202.80
 <i>Miscellaneous</i>		
Custodial.....	\$ 6,480.00	\$ 6,480.00
Farmers Convention.....	.....	300.00
State Fair Exhibits.....	.....	174.00
	\$ 6,480.00	\$ 6,954.00
 <i>Dairy</i>		
Salary Chief.....	\$ 3,000.00	\$ 2,250.00
Travel.....	1,428.29	1,542.30
	\$ 4,428.29	\$ 3,792.30
State Fair.....	\$ 2,343.47	\$ 2,111.36
Rabies.....	15,002.53	3,364.02
Tobacco Work.....	1,927.84	2,645.11
Transfer State Fair Funds.....	19,092.44	.....
Total.....	\$334,093.57	\$246,042.09
Paid to State College.....	\$ 26,350.00	\$ 26,350.00
Seed Improvement Work.....	\$ 4,550.00	\$ 4,550.00

WEIGHTS AND MEASURES

Salaries and Wages.....	\$ 4,586.27	\$ 1,500.00
Supplies and Materials.....	280.66	.....
Postage, Telephone and Telegraph.....	66.50	14.50
Travel.....	3,601.16	893.21
Printing.....	93.15	.....
	\$ 8,627.74	\$ 2,407.71

STATEMENT OF RECEIPTS

JULY 1, 1934—JUNE 30, 1936

	1935-36	1934-35
Fertilizer.....	\$203,566.04	\$197,240.21
Cotton Seed Meal.....	24,306.91	20,333.60
Feed.....	49,934.43	44,868.80
Seed Licenses.....	2,525.00	2,475.00
Condimental Feed.....	460.00	480.00
Serum.....	17,034.14	16,978.14
Costs.....	305.00	352.10
Linseed Oil.....	1,827.29	2,138.45
Bleached Flour.....	12,420.00	12,150.00
Bottling Plants.....	2,000.00	1,600.00
Ice Cream.....	2,220.00	2,030.00
Bakeries.....	1,340.00	1,200.00
Test Farms.....	29,974.16	26,733.18
Entomology.....	1,298.90	1,452.80
Seed Tags.....	1,702.50	1,648.34
Seed Tests.....	.50	4.25
Chicken Tests.....	5,837.15	4,835.52
Markets.....	260.43	235.06
Legumes.....	114.13	105.79
Refunds.....	167.20	212.92
Oleomargarine.....	1,225.00	1,100.00
Rabies.....	21,190.07	4,342.00
State Fair.....	1,000.00	22,647.10
Insecticides.....	289.32	523.00
Analyzing Stomachs.....		200.00
Branding Cattle.....	1.50	1.50
Tobacco.....	1,177.84	1,805.27
	\$382,177.51	\$367,693.03
Balance July 1, 1935.....		\$261,629.45
Balance July 1, 1936.....		278,813.39



